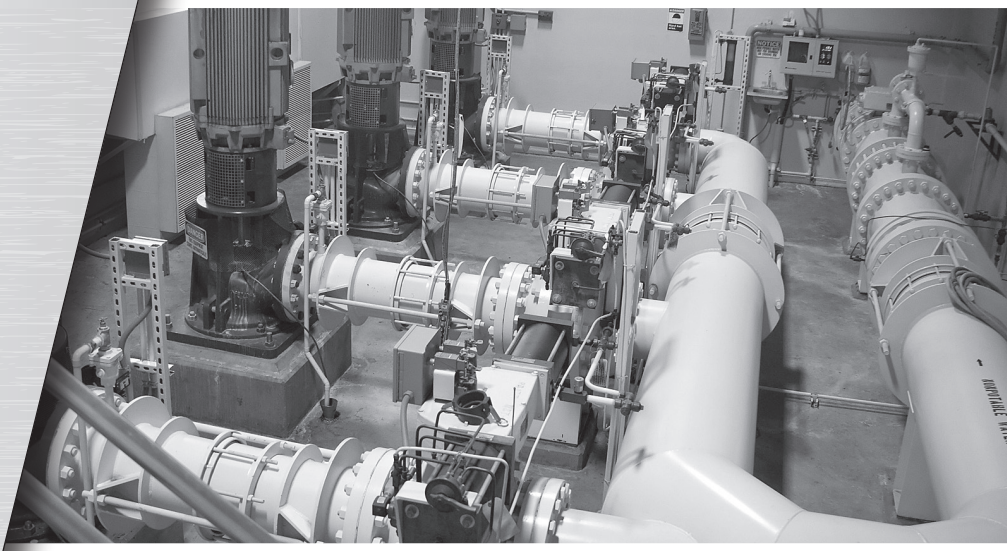
MOTOR PROTECTION

DIVERSIFIED ELECTRONICS



FEATURE MATRIX

MODEL NUMBER	PHASE LOSS	UNDER VOLTAGE	PHASE SEQUENCE	NOMINAL LINE VOLTAGE PHASE-TO-PHASE 50/60 HZ										ENCLOSURE				RESET		LED INDICATOR	UL Recognized	UL Listed	CSA Certified
				120	208	220	230	240	380	440	460	480	575	STYLE A	STYLE B	STYLE E	STYLE N	AUTOMATIC	MANUAL				
PRA-100-AFA			●		●	●	●	●	●	●	●	●		●				●		●			
PRA-100-AFN			●		●	●	●	●	●	●	●	●					●	●		●			
PRA-100-AFE			●		●	●	●	●	●	●	●	●				●		●		●			
SLA-120-AFN	●	●	●	●													●	●			●		
SLA-120-ALA	●	●	●	●										●				●					
SLA-120-ALE	●	●	●	●												●		●		●		●	●
SLA-120-ALER	●	●	●	●												●			●	●		●	●
SLA-120-ASA	●	●	●	●										●				●		●	●		
SLA-120-ASB	●	●	●	●											●			●		●			
SLA-208-AFN	●	●	●		●												●	●			●		
SLA-220-AFN	●	●	●			●											●	●			●		
SLA-230-ALA	●	●	●				●							●				●		●	●		
SLA-230-ALE	●	●	●		●	●	●	●								●		●		●		●	●
SLA-230-ALER	●	●	●		●	●	●	●								●			●	●		●	●
SLA-230-ASA	●	●	●		●	●	●	●						●				●		●	●		
SLA-230-ASB	●	●	●		●	●	●	●							●			●		●			
SLA-240-AFN	●	●	●					●									●	●			●		
SLA-380-ALE	●	●	●						●							●		●		●		●	●
SLA-380-ALER	●	●	●						●							●			●	●		●	●
SLA-380-ASA	●	●	●						●					●				●		●			
SLA-440-AFE	●	●	●							●						●		●		●		●	●
SLA-440-ALE	●	●	●							●	●	●				●		●		●		●	●
SLA-440-ALER	●	●	●							●	●	●				●			●	●		●	●
SLA-440-ASA	●	●	●							●	●	●		●				●		●			
SLA-460-AFE	●	●	●								●					●		●		●		●	●
SLA-480-AFE	●	●	●									●				●		●		●		●	●
SLA-575-AFE	●	●	●										●			●		●		●		●	●
SLA-575-ALE	●	●	●										●			●		●		●		●	●
SUA-120-ALA	●	●	●	●										●				●		●	●		●
SUA-120-ALAU	●	●	●	●										●				●		●		●	●
SUA-230-ALA	●	●	●		●	●	●	●						●				●		●	●		●
SUA-230-ALAU	●	●	●		●	●	●	●						●				●		●		●	●
SUA-380-ASA	●	●	●						●					●				●		●	●		●
SUA-440-ASA	●	●	●							●	●	●		●				●		●	●		●

All models available with fixed operating voltages. Consult factory.

FEATURE MATRIX

MODEL NUMBER	PHASE LOSS	UNDER VOLTAGE	OVER VOLTAGE	PHASE UNBALANCE	PHASE SEQUENCE	ADJUSTABLE DELAY	NOMINAL LINE VOLTAGE PHASE-TO-PHASE 50/60 HZ										STYLE E	RESET		LED INDICATOR	CONTROL VOLTAGE REQUIRED	UL LISTED
							120	208	220	230	240	380	440	460	480	575		AUTOMATIC	MANUAL			
PBC-120-ALE	●	●	●				●										●	●		●		●
PBC-230-ALE	●	●	●					●	●	●	●						●	●		●		●
PBC-400-ALE	●	●	●									●					●	●		●		●
PBC-440-ALE	●	●	●										●	●	●		●	●		●		●
PBC-480-ALE	●	●	●										●	●	●		●	●		●		●
PBC-575-ALE	●	●	●													●	●	●		●		●
PBC-120/208-ALE	●	●	●					●									●	●		●		●
PBC-220/380-ALE	●	●	●									●					●	●		●		●
PBC-277/480-ALE	●	●	●												●		●	●		●		●
PBD-120-ALE	●	●	●		●	●	●										●	●		●		●
PBD-230-ALE	●	●	●		●	●		●	●	●	●						●	●		●		●
PBD-400-ALE	●	●	●		●	●						●					●	●		●		●
PBD-440-ALE	●	●	●		●	●							●	●	●		●	●		●		●
PBD-480-ALE	●	●	●		●	●							●	●	●		●	●		●		●
PBD-575-ALE	●	●	●		●	●										●	●	●		●		●
PBE-120-ASE	●	●	●		●	●	●										●	●		●		●
PBE-230-ASE	●	●	●		●	●		●	●	●	●						●	●		●		●
PBE-400-ASE	●	●	●		●	●						●					●	●		●		●
PBE-440-ASE	●	●	●		●	●							●	●	●		●	●		●		●
PBE-480-ASE	●	●	●		●	●							●	●	●		●	●		●		●
PBE-575-ASE	●	●	●		●	●										●	●	●		●		●
PBE-120/208-ASE	●	●	●		●	●		●									●	●		●		●
PBE-220/380-ASE	●	●	●		●	●						●					●	●		●		●
PBE-277/480-ASE	●	●	●		●	●									●		●	●		●		●
SLB-200-ALEA*				●		●	●	●	●	●	●						●	●		●	●	
SLB-200-ALER*	●			●	●	●	●	●	●	●	●						●		●	●	●	
SLB-400-ALEA*	●			●	●	●						●	●	●	●		●	●		●	●	
SLB-400-ALER*	●			●	●	●						●	●	●	●		●		●	●	●	
SLC-120-ALE	●			●			●										●	●		●		
SLC-230-ALE	●			●				●	●	●	●						●	●		●		
SLC-380-ALE	●			●								●					●	●		●		
SLC-440-ALE	●			●									●	●	●		●	●		●		

*The SLB Series is 60 Hz standard.

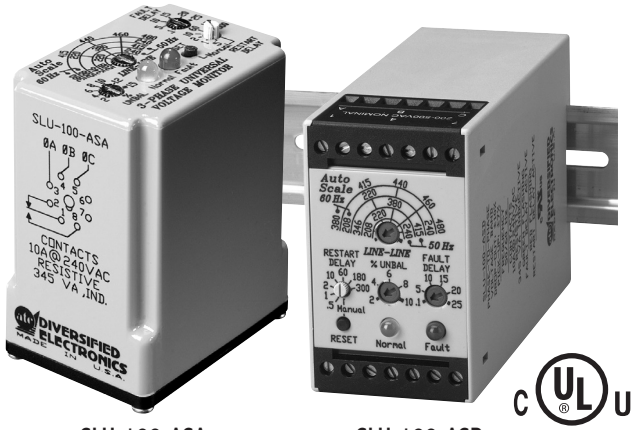
FEATURE MATRIX

MODEL NUMBER	PHASE LOSS	UNDER VOLTAGE	OVER VOLTAGE	PHASE UNBALANCE	FREQUENCY SHIFT	PHASE SEQUENCE	ADJUSTABLE DELAY	NOMINAL LINE VOLTAGE PHASE-TO-PHASE 50/60 HZ										STYLE A (Plug-In)	STYLE E (Surface Mount)	DIN RAIL MOUNT	DIN RAIL/SURFACE MT.	RESET		LED INDICATOR	UL RECOGNIZED	UL LISTED	CSA CERTIFIED	CURRENT: OVER/UNDER/UNBAL.
								120	208	220	230	240	380	440	460	480	575					AUTOMATIC	MANUAL					
SLD-120-ALE	●	●		●		●	●	●											●			●		●		●		
SLD-120-ASA	●	●		●		●	●	●										●				●		●	●			
SLD-230-ALE	●	●		●		●	●		●	●	●	●							●			●		●		●		
SLD-230-ASA	●	●		●		●	●		●	●	●	●						●				●		●	●			
SLD-380-ALE	●	●		●		●	●						●						●			●		●		●		
SLD-380-ASA	●	●		●		●	●						●					●				●		●	●			
SLD-440-ALE	●	●		●		●	●							●	●	●			●			●		●		●		
SLD-440-ASA	●	●		●		●	●							●	●	●		●				●		●	●			
SLE-120-ALE	●	●		●				●											●			●		●		●		
SLE-230-ALE	●	●		●					●	●	●	●							●			●		●		●		
SLE-380-ALE	●	●		●									●						●			●		●		●		
SLE-440-ALE	●	●		●										●	●	●			●			●		●		●		
SLH-120-ALE	●	●				●		●											●			●		●		●		
SLH-230-ALE	●	●				●			●	●	●	●							●			●		●		●		
SLH-440-ALE	●	●				●								●	●	●			●			●		●		●		
SLJ-120-ALE	●	●				●	●	●											●			●		●				
SLJ-230-ALE	●	●				●	●		●	●	●	●							●			●		●				
SLJ-380-ALE	●	●				●	●						●						●			●		●				
SLJ-440-ALE	●	●				●	●							●	●	●			●			●		●				
SLM-120-ASE	●	●	●	●	●	●	●	●											●			●		●		●	●	
SLM-230-ASE	●	●	●	●	●	●	●		●	●	●	●							●			●		●		●	●	
SLM-380-ASE	●	●	●	●	●	●	●						●						●			●		●		●	●	
SLM-440-ASE	●	●	●	●	●	●	●							●	●	●			●			●	●	●		●	●	
SLM-575-ASE	●	●	●	●	●	●	●										●		●			●	●	●		●	●	
SLU-100-ASA	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●		●				●	●	●		●		
SLU-100-ASD	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●				●		●	●	●		●		
SLU-600-ASTDS	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●				●	●	●	●		●		
MPA-1000	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●					●	●	●			●		●
MPA-1100	●	●	●	●	●	●	●	●													●	●	●			●		●

FEATURE MATRIX

MODEL NUMBER	UNDER VOLTAGE	OVER VOLTAGE	ADJUSTMENT–KNOB	ADJUSTMENT–LOCKNUT	ADJUSTMENT–FIXED	NOMINAL LINE VOLTAGE											ENCLOSURE			LED INDICATOR	UL RECOGNIZED	CSA CERTIFIED
						12 VDC	24 VAC	24 VDC	28 VDC	48 VDC	110 VDC	120 VAC	208 VAC	220 VAC	230 VAC	240 VAC	440 VAC	STYLE A	STYLE E	STYLE N			
UOA-12-D*A	●		●	●	●	●												●				●	●
UOA-24-A*A	●		●	●	●		●											●				●	●
UOA-24-D*A	●		●	●	●			●										●				●	●
UOA-48-D*A	●		●	●	●					●								●				●	●
UOA-110-D*A	●		●	●	●						●							●				●	●
UOA-120-A*A	●		●	●	●							●						●				●	●
UOA-120-AFN	●				●							●								●		●	
UOA-208-A*A	●		●	●	●								●					●				●	●
UOA-208-AFN	●				●								●							●			
UOA-220-AFN	●				●									●						●		●	
UOA-230-AFN	●				●										●					●		●	
UOA-240-A*A	●		●	●	●										●	●		●				●	●
UOA-240-AFN	●				●											●				●		●	
VBA-12-D*A	●	●	●	●	●	●												●				●	●
VBA-24-A*A	●	●	●	●	●		●											●				●	●
VBA-24-AFN	●	●			●		●													●			
VBA-24-D*A	●	●	●	●	●			●										●				●	●
VBA-28-D*A	●	●	●	●	●				●									●				●	●
VBA-48-D*A	●	●	●	●	●					●								●				●	●
VBA-110-D*A	●	●	●	●	●						●							●				●	●
VBA-120-A*A	●	●	●	●	●							●						●				●	●
VBA-120-AFN	●	●			●							●								●			
VBA-208-A*A	●	●	●	●	●								●					●				●	●
VBA-208-AFN	●	●			●								●							●			
VBA-220-AFN	●	●			●									●						●			
VBA-230-AFN	●	●			●										●					●			
VBA-240-A*A	●	●	●	●	●										●	●		●				●	●
VBA-240-AFN	●	●			●											●				●			

Adjustments: F = Fixed, K = Knob, L = Locknut



SLU-100-ASA SLU-100-ASD

c UL us LISTED

IND. CONT. EQ 496Y

Universal Phase Monitor

Phase Monitor Relays (3-Phase Monitors) provide cost-effective protection against premature equipment failure caused by voltage faults on 3-Phase systems (Wye or Delta). The SLU Series multi-mode phase monitoring relay, was designed for the convenience of electrician's, maintenance managers and engineers. A single SLU Phase Monitoring Relay can be easily adjusted for the voltage, imbalance percentage and time delay requirements to protect against unbalanced voltages or single phasing regardless of any regenerative voltages.

Both **DELTA** and **WYE** systems may be monitored. In Wye systems, connections to neutral are NOT required. The SLU-100 Series is UL Listed under UL File Number E55826.

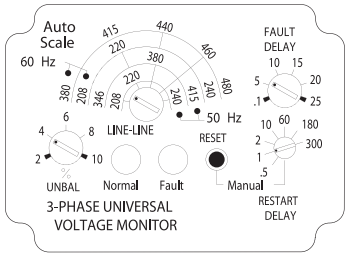
NOTE: Not recommended for generator or variable frequency drive applications. Call technical support for application assistance.

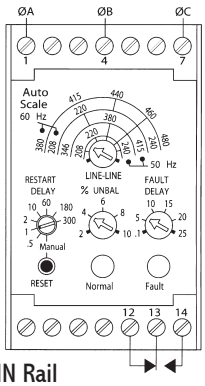
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
SLU-100-ASA	Universal Phase Monitor
SLU-100-ASD	Din Rail Mount Universal Phase Monitor

TOP LABELS

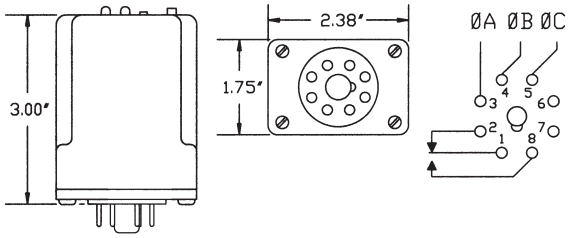
Plug-In

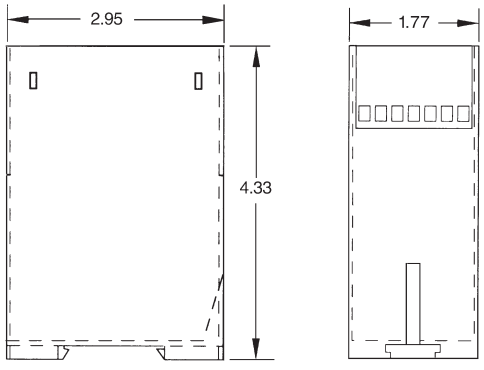




DIN Rail

DIMENSIONS (INCHES)





SPECIFICATIONS

AUTO RANGING SCALES	Frequency	Nominal Line-to-Line Voltages	Adjustable Range
	60Hz	208, 220, 240, 380, 415, 440, 460, 480	200-250 360-500
	50Hz	208, 220, 240 346, 380, 415	200-250 330-430
VOLTAGE BAND	Drop-out	±10% of Range Setting (Under/Over)	
	Pick-up	±7% of Range Setting (Under/Over)	
MAXIMUM VOLTAGE	550 VAC (Line-to-Line)		
PHASE SEQUENCE	ABC (Will Not Operate On CBA Sequence)		
POWER REQUIRED	90VA Max.		
PHASE UNBALANCE	2% to 10%, Adjustable Drop-out		
	Hysteresis	10% of Setting	
PHASE SHIFT	13° Drop-out, 12° Pick-up (Ø-Loss)		
FREQUENCY SHIFT	50/60 Hz		
	Drop-out	± 4%	
	Pick up	± 3%	
RESET	Automatic or Manual Mode		
RELAY OUTPUT	SPDT, 10A @ 240VAC Resistive, 1/2 HP @240VAC		
INDICATORS		Flashing	Continuous
	Normal (Green LED)	Fault Delay Active	Relay Energized
	Fault (Red LED)	Restart Delay Active	Relay De-energized
RESPONSE	Power Up	2.5 SEC Minimum	
	Fault Delay	.1 to 25 SEC., Adjustable	
	Severe Fault	100mS (Phase-Loss, Unbalance or Phase Reversal)	
	Restart	0.5 to 300 S, Adjustable (Auto Reset)	
TEMPERATURE RATINGS	Operate	32° to 131°F (0° to +55°C)	
	Storage	-49° to 185°F (-45° to +85°C)	
REPEAT ACCURACY	1% @ Fixed Condition		
TERMINALS (DIN)	Slotted Screw Terminal Clamps, 12AWG Max.		
ENCLOSURE	Style "A"	LEXAN® Dust Cover	
	DIN	35mm DIN Rail, 14 Term Polycarbonate Housing	
WEIGHT	0.35 to 0.5 lbs.		

The ATC-Diversified Electronics **SLU-600-ASTDS** Universal Phase Monitor protects 3-phase motors up to 700VAC. The **RAPID CYCLING** feature prevents motors cycling due to load-induced line fault conditions. Powered by 120VAC, this reliable motor protection relay is unaffected by transients and disturbances from the monitored power source. The SLU-600 Series is UL Listed under UL File Number E55826.

Universal Phase Monitor

SPECIFICATIONS

AUTO RANGING SCALES	Frequency	Nominal Line-to-Line Voltages	Adjustable Range
	60Hz	208, 220, 240	200-250
		380, 415, 440,	360-500
		460, 480, 575, 600	550-630
	50Hz	208, 220, 240	200-250
		346, 380, 415	330-430
3Ø VOLTAGE BAND	Drop-out	±10% of Range Setting (Under/Over)	
	Pick-up	±7% of Range Setting (Under/Over)	
CONTROL VOLTAGE	120 VAC ±10%, 50/60Hz		
MAXIMUM VOLTAGE	700 VAC (Line-to-Line)		
PHASE SEQUENCE	ABC (Will Not Operate On CBA Sequence)		
POWER REQUIRED	90VA Max.		
PHASE UNBALANCE	2% to 10%, Adjustable Drop-out		
	Hysteresis	10% of Setting	
PHASE SHIFT	13° Drop-out, 12° Pick-up (Ø-Loss)		
FREQUENCY SHIFT	50/60 Hz		
	Drop-out	± 4%	
	Pick up	± 3%	
RAPID CYCLING	5 Cycle Lockout, 30-Min. Cycle Count Reset		
RESET	Automatic or Manual Mode Clears Rapid Cycle Count		
RELAY OUTPUT	DPDT, 10A @ 240 VAC Resistive		
LED'S		Flashing	Continuous
	Normal (Green LED)	Fault Delay Active	Relay Energized
	Fault (Red LED)	Restart Delay Active	Relay De-energized
	Over (Red LED)	Restart Delay Active	Relay De-energized
	Unbal / Ø Loss (Red LED)	Restart Delay Active	Relay De-energized
RESPONSE	Power Up	2.5 S Minimum	
	Fault Delay	0.1 to 25 S, Adjustable	
	Severe Fault	100mS (Ø-Loss, Unbalance or Ø Reversal)	
	Restart	0.5 to 300 S, Adjustable (Auto Reset)	
TEMPERATURE RATINGS	Operate	32° to 131°F (0° to +55°C)	
	Storage	-49° to 185°F (-45° to +85°C)	
REPEAT ACCURACY	1% @ Fixed Condition		
TERMINALS	Plug and Socket Term Block with Spring Pressure Wire Retention, 12 AWG Max.		
ENCLOSURE	35mm DIN Rail or Surface Mount, Polycarbonate Housing		
WEIGHT	1.10 lbs.		

c UL us LISTED
IND. CONT. EQ
496Y

- Monitors up to 700 VAC
- DIN Rail or Surface Mount
- Operating Range 200-630 VAC
- Manual or Automatic Reset
- Adjustable Restart Delay
- Adjustable Fault Delay

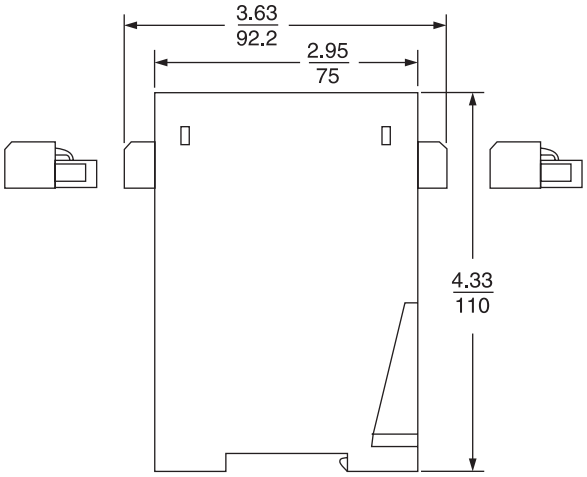
PROTECTS AGAINST:

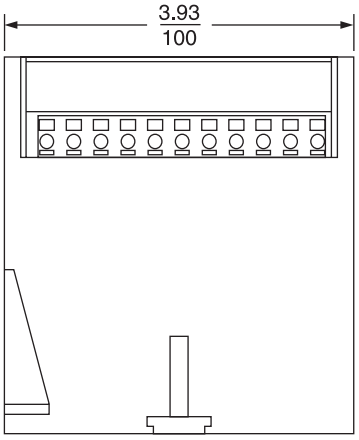
- Rapid Cycling
- Phase Loss
- Phase Reversal
- Phase Unbalance
- Phase Shift
- Over/Under Voltage
- Over/Under Frequency

ORDERING INFORMATION

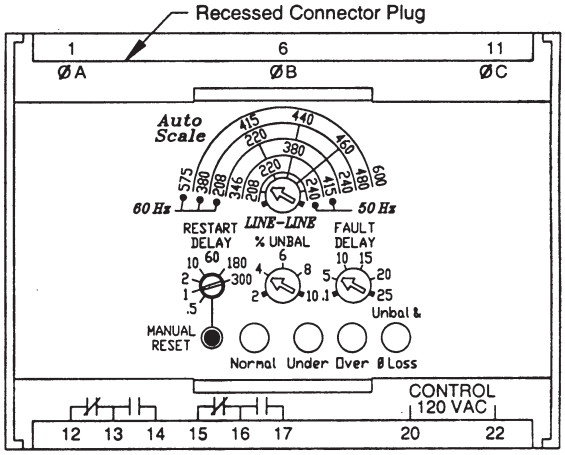
MODEL NUMBER	DESCRIPTION
SLU-600-ASTDS	Universal Phase Monitor/Relay

DIMENSIONS (INCHES/MILLIMETERS)





TOP LABEL



LED STATUS CHART

● = OFF
○ = ON
☼ = FLASHING

	Normal Green LED	Under Red LED	Over Red LED	Unbal & Ø Loss Red LED
Powering Up/First 3 Sec	●	●	●	☼
Powered Up/Normal Voltages	○	●	●	●
Relay ON/Under Voltage Detected/FAULT DELAY active	☼	●	●	●
Relay ON/Over Voltage Detected/ FAULT DELAY active	☼	●	●	●
Relay ON/Unbal or Ø Loss Detected/FAULT DELAY active	☼	●	●	●
Relay OFF/Under Voltage Failure	●	○	●	●
Relay OFF/Over Voltage Failure	●	●	○	●
Relay OFF/Unbal or Ø Loss Failure	●	●	●	○
Relay OFF/Under Voltage Corrected/RESTART DELAY active	●	☼	●	●
Relay OFF/Over Voltage Corrected/RESTART DELAY active	●	●	☼	●
Relay OFF/Unbal or Ø Loss Corrected/RESTART DELAY active	●	●	●	☼

The **MotorGuardian**™ is a microprocessor based overload relay designed to provide protection for 3-Phase AC motors. It offers a broad range of features in one compact package providing a cost effective solution for monitoring and managing motor performance. Actual motor operating conditions are accessed by the scrolling menu and viewed by a two line highly visible vacuum fluorescent display. Fault conditions are also displayed indicating the specific cause of the occurring fault. A unique feature of the The MotorGuardian™ is its ease of installation. It is provided with Clamp-On C.T.'s that can accommodate up to 1500 ampere loads.

There are two separate models that cover two input voltage ranges. The Model MPA-1000 has a direct input voltage range of 200-500 VAC, 3-phase. The MPA-1100 has been designed to accept secondary volts from medium voltage transformers and has an input range of 120-240VAC, 3-phase. The MPA Series is UL Listed under UL File Number E55826.

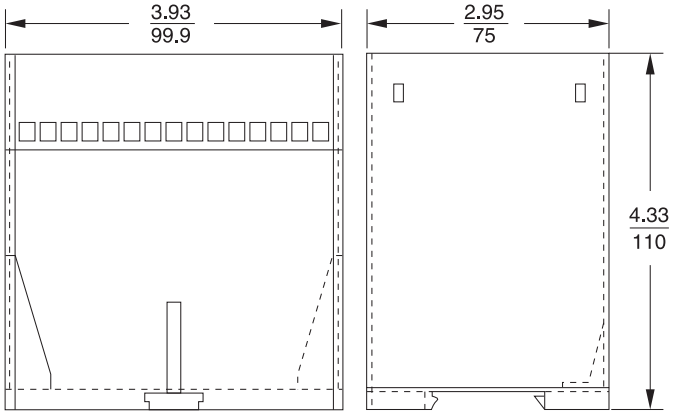
c UL us LISTED

IND. CONT. EQ. 496Y

"MOTORGUARDIAN™"

Motor Performance Analyzer

DIMENSIONS (INCHES/MILLIMETERS)



- Standard (200-500 VAC) & Medium Voltage (20-240 VAC) Versions
- True RMS Monitoring
- Up to 1500 Amp Loads
- 3 External Clamp-On C.T.'s
- 9 Programmable Trip Points
- 9 Programmable Alarm Points
- 2 RTD Lead Compensated Temperature Inputs
- Time Tagged Fault History
- DPDT Output; SPDT Alarm Output
- Bidirectional RS485 output Modbus® RTU Protocol
- Built-in Real-Time Clock
- 2 x 16 Fluorescent Display
- No Control Voltage Required
- All English Programming (Scrolling Menu)
- Setpoint Change Lockout

ORDERING INFORMATION

3 Required, 1 Per Phase

Order separately using SCT part numbers listed within chart or specify which using Code for MPA Part No. at left of chart.

Code for MPA Part No.	Full Load Amps/ Phase	0.75" Opening C.T. Part No.	1.25" Opening C.T. Part No.	2.0" Opening C.T. Part No.	C.T. Program Code (Full Scale Amps.)
01A	1.5 - 15A	SCT-0750-015	-	-	015
02A	15 - 150A	SCT-0750-150		-	150
02B	15 - 150A		SCT-1250-150	-	150
03B	150 - 600A	-	SCT-1250-600		600
03C	150 - 600A	-		SCT-2000-600	600
04C	600 - 1500A	-		SCT-2000-1500	1500

MODEL NUMBER

MODEL NUMBER	MPA			
VOLTAGE				
200-500 VAC		1000		
120-240 VAC		1100		
AMPS				
1.5-15 A			01	
15-150 A			02	
150-600 A			03	
600-1500 A			04	
CT OPENING SIZE				
0.75" Opening				A
1.25" Opening				B
2.0" Opening				C

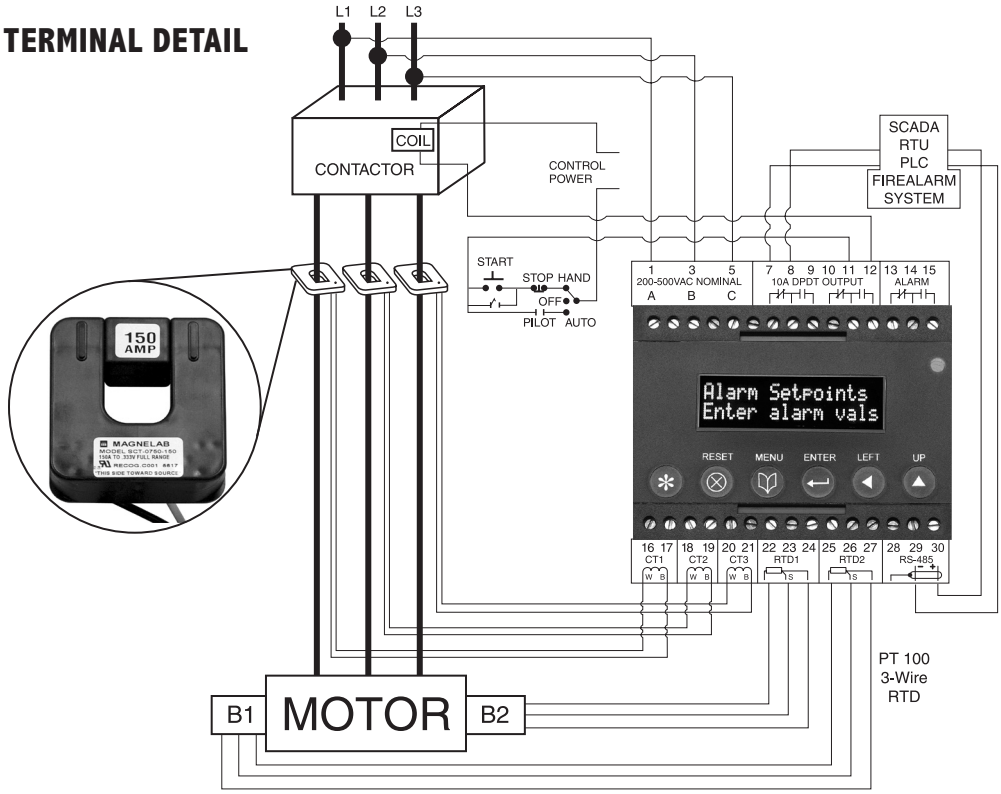
SPECIFICATIONS

RELAY ACCURACY	Voltage	±1%
	Current	±1%
	G.F. Current	±10%
	Timing	5% ±1 Second
INPUT VOLTAGE	MPA-1000	200-500 VAC 3-Phase (Nominal)
	MPA-1100	120-240 VAC 3-Phase ±20% (Nominal)
FREQUENCY	50/60 Hz	
PHASE SEQUENCE	ABC (will not operate CBA)	
OUTPUT CONTACT	DPDT; Form "C" 10A per pole max / 16 A Total @ 240 VAC	
ALARM OUTPUT	SPDT; Form "C" 7 A @ 240 VAC	
COMMUNICATION OUTPUT	RS485 Modbus RTU	
BAUDRATE	2400 - 115 200	
PARITY	Even, None	
WEIGHT	42 oz.	
CT WEIGHTS	"A" size CT's	4 oz.
	"B" size CT's	11 oz.
	"C" size CT's	25 oz.
TIME DELAYS		
RESTART DELAY #1	Rapid Cycle Timer; 0-999 Sec	
RESTART DELAY #2	Cool Down Timer; 0-999 Min., Active after over current or unbalance fault.	
RESTART DELAY #3	Dry Well Recovery; 0-999 Min., Active after under current fault.	
TRIP DELAY #1	Under Current, 0-99 Sec.	
TRIP DELAY #2	Over & Under Voltage, 0-99 Sec.	

PROGRAMMABLE TRIP/ALARM POINT
(Each setpoint can be disabled)

LOW VOLTAGE	180-450V RMS
HIGH VOLTAGE	220-550V RMS
VOLTAGE UNBALANCE	1-15%
CURRENT UNBALANCE	1-15%
OVER CURRENT	Up to 100% of C.T. Range. Dependent on C.T. Range, FLA, and Trip Class
UNDER CURRENT	Up to 100% of C.T. Range
GROUND FAULT	2 - 13% of CT Range
OVER TEMP. 1	1-250°C 3-wire 100 Ω Platinum Input or 2-wire with jumper
OVER TEMP. 2	1-250°C 3-wire 100 Ω Platinum Input or 2-wire with jumper
OVER CURRENT	NEMA 5, 10, 15, 20, 30
TRIP CLASS	J jam protection can be enabled for all classes
RESTART COUNTER	
AUTO RESTART	Number of Restarts, 0 (Manual), 1-8 or 9 (Automatic)
C.T. SPECIFICATIONS	
ACCURACY	1%
TERMINATIONS	(2) 8ft. twisted pair, 22 AWG
MOUNTING	Snap Closing/Opening Feature

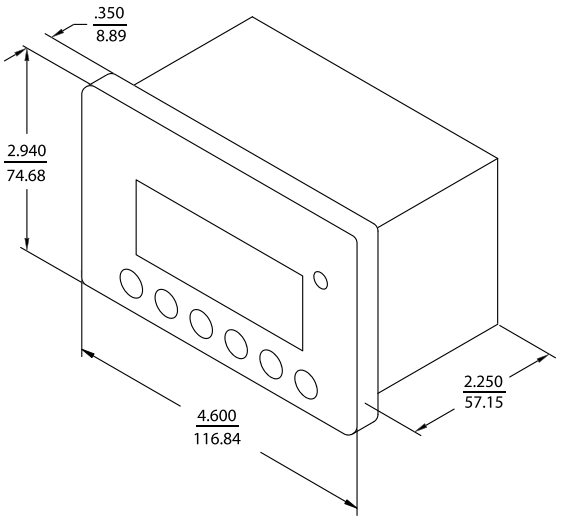
TERMINAL DETAIL

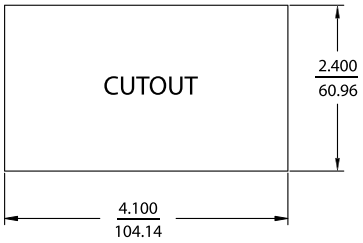


The **MGR Remote Manager** is a component of the MotorGuardian family that is used in conjunction with the Motor Performance Analyzer (MPA). It provides full control and monitoring of the MPA functions by mimicking the keypad and display. The front panel programming is identical to the MPA that simplifies the learning process. This external control provides an efficient and safe tool away from potentially dangerous voltages.

The MGR is environmentally protected (NEMA 4X) and is easily mounted using a cutout on the front of a control panel or MCC. A vacuum fluorescent display (VFD) was selected to provide high visibility in both high and low light situations.

DIMENSIONS (INCHES/MILLIMETERS)





MGR Remote Manager

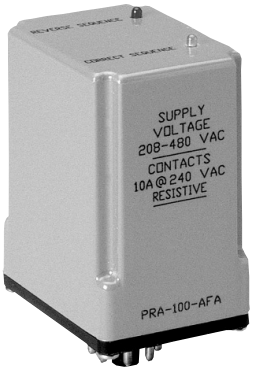
- MPA Remote Monitoring
- Total Control of MPA Functions
- Identical Keypad and Display as MPA-1000 and MPA-1100
- NEMA 4X Protection
- 2 x 16 Vacuum Fluorescent Display
- Polycarbonate Enclosure with Captive Hardware
- Removable Input Terminal Block

ORDERING INFORMATION

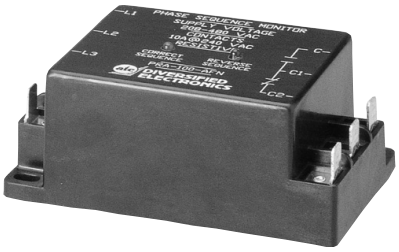
MODEL NUMBER	DESCRIPTION
MGR-1000	MGR Remote Manager

SPECIFICATIONS

INPUT VOLTAGE	115/230 VAC ±15% 50-60 Hz Model Selectable	
POWER CONSUMPTION	3 Watts (Max.)	
ENVIRONMENT	-10°C to +55°C NEMA 4X	
COMMUNICATION PORTS	RS485 Modbus RTU	
	Baudrate	2400 to 115200
	Parity	Even, None
WEIGHT	0.9 lbs	



STYLE "A"



STYLE "N"

The **PRA-100 Series** Phase Sequence Monitors are designed to allow the output to energize only when the phase connections are in the proper sequence. For use in applications where motor direction is critical or the installation is required by code to have sequence detection.

When the phase sequence is correct and the operating voltage is present on all phases, the relay will energize and the green LED indicator will glow. If the phases are in reverse rotation, the relay will not energize and the red LED indicator will glow. The PRA-100 Series will not detect phase loss while the motor is turning. The PRA Series is UL Listed under UL File Number E55826.

Phase Sequence Monitor

SPECIFICATIONS

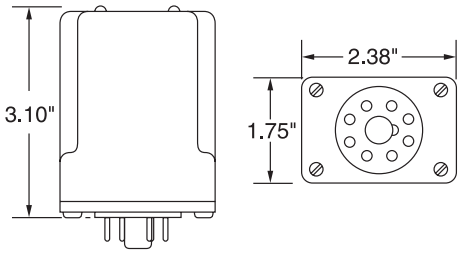
OPERATING VOLTAGE	208-480 VAC ±15%, phase-to-phase, 50/60	
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
TOTAL APPARENT POWER	11 VA @ 480 VAC	
OUTPUT RATING	Style A & N	SPDT, 10 Amps @ 240 VAC Resistive, 1/2 hp @ 240 VAC
	Style E	DPDT, 10 Amps @ 240 VAC Resistive, 1/2 hp @ 240 VA
RESET	Automatic	
INDICATORS	Green LED	Glows on correct sequence
	Red LED	Glows on incorrect sequence
RESPONSE TIMES	200 mSEC. (approximately)	
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style "A"	LEXAN® dust cover 8-Pin plug-in. RB-08 or OT-08 Socket
	Style "N"	Glass filled VALOX® surface mounted 6-1/4" male quick connect
	Style "E"	LEXAN® Surface Mount, #8-32 screws
WEIGHT	Style "A"	0.3 lbs.
	Style "N"	0.35 lbs.
	Style "E"	0.75 lbs

MODEL NUMBER

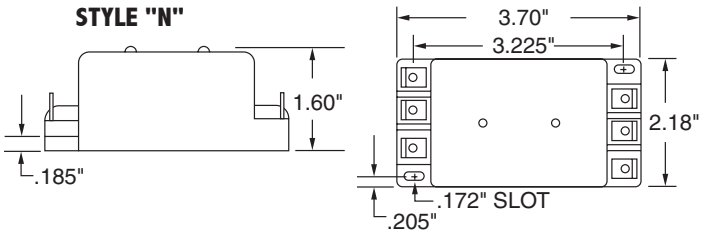
MODEL NUMBER	PRA	100	
ENCLOSURES			
LEXAN® dust cover 8-Pin plug-in. RB-08 or OT-08 Socket			AFA
Glass filled VALOX® surface mounted 6-1/4" male quick connect			AFN
LEXAN® Surface Mount, #8-32 screws			AFE

DIMENSIONS (INCHES/MILLIMETERS)

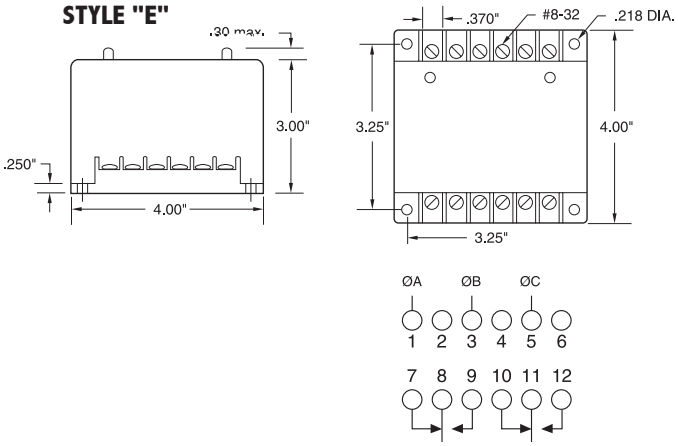
STYLE "A"



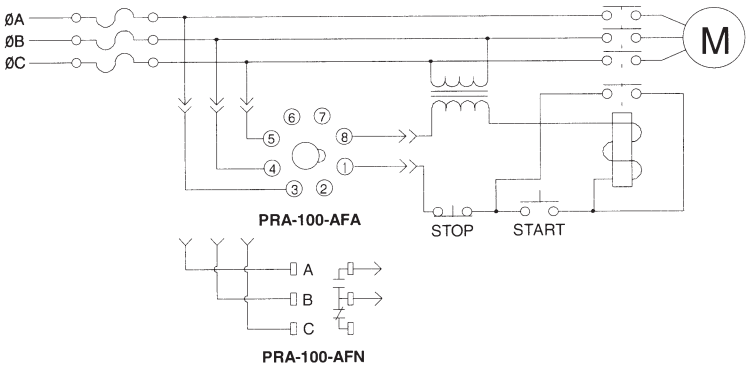
STYLE "N"



STYLE "E"



WIRING



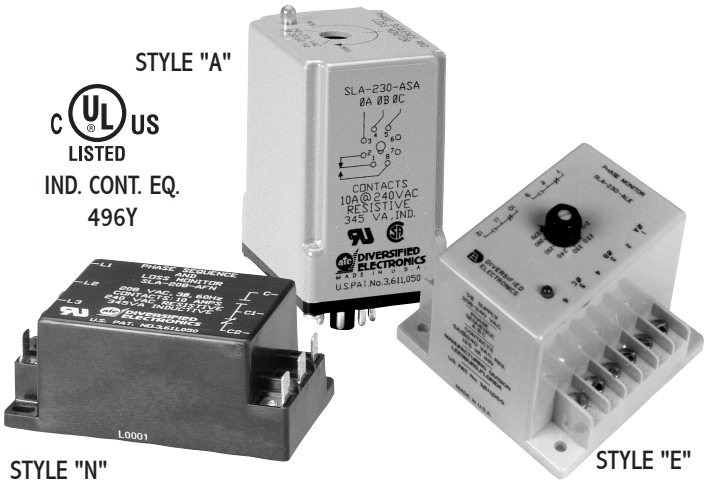
The ATC Diversified **SLA Series** is designed to protect 3-phase equipment against **PHASE LOSS, UNDER VOLTAGE**, and **PHASE REVERSAL** conditions.

With normal operating voltages applied in the proper ABC sequence, the internal relay will energize (PICK-UP). When incorrect phase sequence or phase loss occurs or the three-phase voltages fall below the drop out voltages, the relay will de-energize (DROP-OUT). On models featuring indicators, the LED glows when all line conditions are normal.

Both Delta and Wye systems may be monitored. In Wye systems, connections to neutral are NOT required.

For UL Listed units, with field wiring terminals, copper wire with 60°/75°C rating must be used for control circuitry connections.

NOTE: When a phase is lost while the motor is running, a condition known as regeneration occurs where a voltage is induced into the open phase nearly equal in magnitude to the normal phase-to-phase voltage. However, with the exception of lightly loaded motors, enough change is detected by the SLA to provide the required protection when properly adjusted. The SLA Series is UL Listed under File Number E55826.



Phase Monitors

- Available up to 480 VAC (625 VAC with "E" style)
- Delta or Wye Systems
- Fixed, Lock Shaft, or Screwdriver Adjustment
- Several Enclosure Styles

PROTECTS 3-PHASE EQUIPMENT AGAINST:

- Phase Loss
- Under Voltage
- Phase Reversal

TYPICAL APPLICATIONS:

- Air Handlers
- Computer Power Protection
- Conveyor Drive
- Water Waste & Sewage Machinery
- Oil & Gas Pumps
- Sawmill & Woodpump Machinery
- Power Substation
- Automatic Transfer Switching for Monitoring Emergency Power Supplies
- Irrigation Pumps
- Lift Station Pumps
- Robotics Equipment
- Elevator Drives
- Commercial/Industrial Air Conditioning & Refrigeration Compressors

SPECIFICATIONS

DROP-OUT VOLTAGE	1 Ø Low	83% of Nominal
	3 Ø Low	90% of Nominal
RESPONSE TIMES STYLE "A" & "E"	Models Up to 300 VAC	
	Operate	250 mSEC
	Release	0.5 SEC
	Models Over 300 VAC	
	Operate	1.0 SEC
	Release	2.0 SEC
RESPONSE TIMES STYLE "N"	Operate	60 mSEC
	Release	0.5 SEC
POWER REQUIRED	Style "A"	3 VA (approx.)
	Style "E"	Models up to 300 VAC: 3 VA (max.) Models over 300 VAC: 7 VA (max.) Models over 500 VAC: 3 VA (max.)
	Style "N"	3 VA (max.)
OPERATING VOLTAGE	See Ordering Information	
RESET	Automatic (Manual Optional)	
INDICATOR LED	Glows when all conditions are Normal (On Applicable Models)	
OUTPUT RATING	SPDT (style "A" and "N")	
	DPDT (style "E")	
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
U.S. PATENT NUMBER	3,611,050	
WEIGHT	Style "A"	NET: 2.24 oz Shipping: 2.56 oz
	Style "E"	NET: 4.8 oz Shipping: 5.76 oz
	Style "N"	NET: 5.3 oz Shipping: 5.6 oz

MODEL NUMBER

MODEL NUMBER	SLA		A			
OPERATING VOLTAGE						
See Ordering Information		XXX				
TYPE OF OPERATION						
Fixed				F		
Lock Shaft Adjusted				L		
Screwdriver Adjusted				S		
ENCLOSURE STYLE						
Octal Plug-In, Dust Cover					A	
Blade Plug-In, Dust Cover					B	
Surface Mounted, #8 Screw Terminals					E	
Surface Mounted, 1/4" Quick Disconnect Terminals					N	
OPTIONS						
Add R Suffix when manual reset is required, (available only in style "E" enclosure)						R
Plug-In models are UL listed only when used with RB-08 relay socket.						U

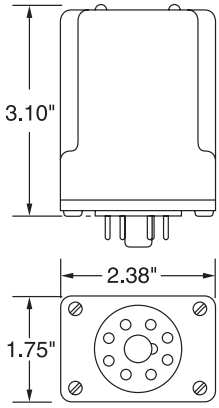
STYLE "A"

STYLE "N"

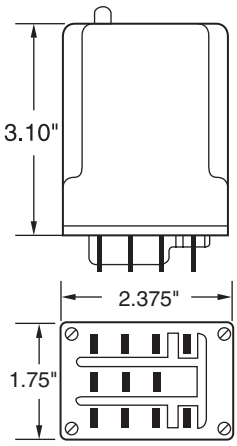
STYLE "E"

DIMENSIONS (INCHES)

STYLE "A"



STYLE "B"



WIRING

STYLE "A"

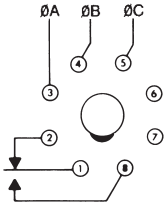


Figure 1
RB-08 or OT-08

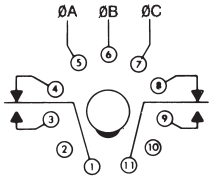


Figure 2
RB-11

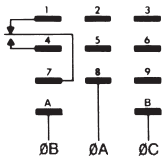
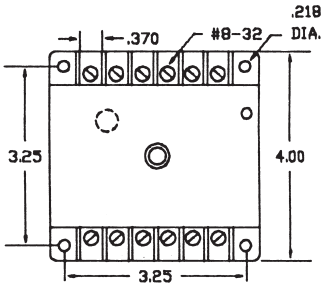
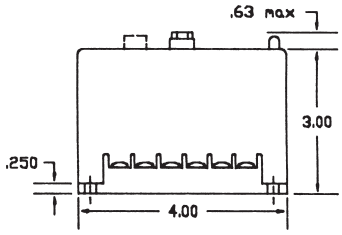


Figure 3
70-463-1

STYLE "E"





STYLE "E"

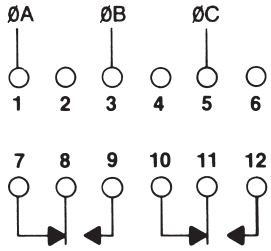


Figure 4

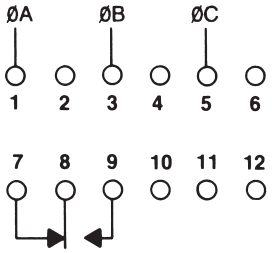
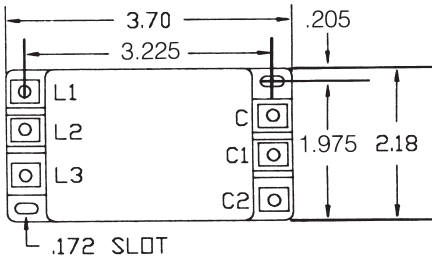
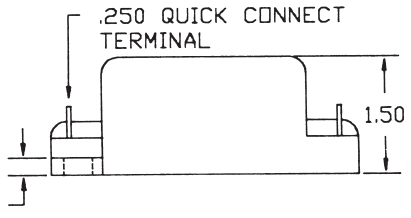


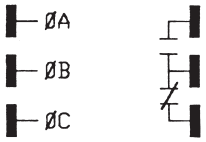
Figure 5

STYLE "N"





STYLE "N"



ORDERING INFORMATION

STYLE A PLUG-IN

MODEL NUMBER	OPERATING VOLTAGE	TYPE OF ADJUSTMENT	DROP-OUT VOLTAGE 1 Ø LOW	DROP-OUT VOLTAGE 3 Ø LOW	AGENCY APPROVAL	OUTPUT RATINGS
SLA-120-ALA	95-130 Adj	Lock Shaft	79-108	85-117	—	DPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC. Figure 2
SLA-120-ASA		Screwdriver			c UL us, CSA	SPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 1
SLA-120-ASB					—	SPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 3
SLA-230-ALA	190-270 Adj.	Lock Shaft	158-224	171-243	c UL us	DPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 2
SLA-230-ASA		Screwdriver			c UL us, CSA	SPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 1
SLA-230-ASB					—	SPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 3
SLA-380-ASA	350-440 Adj.		290-365	315-396	—	SPDT, 360 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 1
SLA-440-ASA	430-480 Adj.		378-461	410-500		
SUA-120-ALA	95-130 Adj.	Lock Shaft	79-108	85-117	c UL us, CSA	SPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 1
SUA-120-ALAU*					IND. CONT. EQ 496Y, UL LISTED, CSA	
SUA-230-ALA	190-270 Adj.		158-224	171-243	c UL us, CSA	
SUA-230-ALAU*					IND. CONT. EQ 496Y, UL LISTED, CSA	
SUA-380-ASA	350-440 Adj.	Screwdriver	290-365	315-396	c UL us, CSA	SPDT, 360 VA Inductive; 10 Amps Resistive @ 240 VAC, Figure 1
SUA-440-ASA	430-480 Adj.		410-500	410-500		

*UL Listed only when used with RB-08 relay socket; 5 Amps Resistive @ 240 VAC. All voltages referenced on this page are phase-to-phase.
Models also available with fixed operating voltages. Consult factory.

STYLE E SURFACE MOUNTED ENCLOSURE

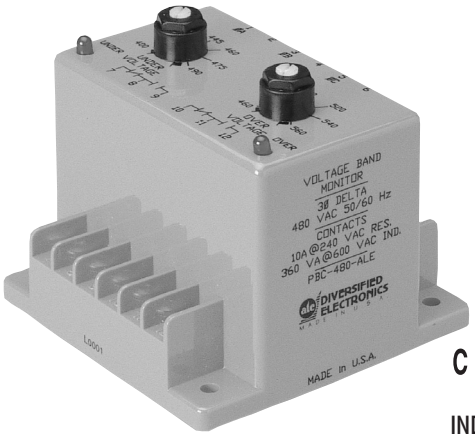
MODEL NUMBER	OPERATING VOLTAGE	DROP-OUT VOLTAGE 1 Ø LOW	DROP-OUT VOLTAGE 3 Ø LOW	RESET	AGENCY APPROVAL	OUTPUT RATINGS
SLA-120-ALE	95-130 Adj.	79-108	85-117	Automatic	IND. CONT. EQ 496Y, c UL us LISTED, CSA	DPDT, 211 VA Inductive; 10 Amps Resistive @ 120 VAC. Figure 4
SLA-120-ALER				Manual	IND. CONT. EQ 496Y, c UL us LISTED, CSA	DPDT, 211 VA Inductive; 10 Amps Resistive @ 120 VAC. Figure 4
SLA-230-ALE	190-270 Adj.	158-224	171-243	Automatic	IND. CONT. EQ 496Y, c UL us LISTED, CSA	DPDT, 345 VA Inductive; 5 Amps Resistive @ 240 VAC. Figure 4
SLA-230-ALER				Manual	IND. CONT. EQ 496Y, c UL us LISTED, CSA	DPDT, 345 VA Inductive; 5 Amps Resistive @ 240 VAC. Figure 4
SLA-380-ALE	350-440 Adj.	290-365	315-396	Automatic	IND. CONT. EQ 496Y, c UL us LISTED, CSA	DPDT, 360 VA Inductive; 3 Amps Resistive @ 600 VAC. Figure 4
SLA-380-ALER				Manual	IND. CONT. EQ 496Y, c UL us LISTED, CSA	SPDT, 360 VA Inductive; 3 Amps Resistive @ 600 VAC. Figure 5
SLA-440-ALE	430-480 Adj.	357-398	387-432	Automatic	IND. CONT. EQ 496Y, c UL us LISTED, CSA	DPDT, 360 VA Inductive; 3 Amps Resistive @ 600 VAC. Figure 4
SLA-440-ALER				Manual	IND. CONT. EQ 496Y, c UL us LISTED, CSA	SPDT, 360 VA Inductive; 3 Amps Resistive @ 600 VAC. Figure 5
SLA-575-ALE	525-625 Adj.	436-519	473-563	Automatic	IND. CONT. EQ 496Y, c UL us LISTED, CSA	DPDT, 360 VA Inductive; 3 Amps Resistive @ 600 VAC. Figure 4

All voltage referenced are phase-to-phase.—Models also available with fixed operating voltages. Consult factory.

STYLE N EPOXY ENCAPSULATED

MODEL NUMBER	OPERATING VOLTAGE	TYPE OF OPERATION	DROP-OUT VOLTAGE 1 Ø LOW	DROP-OUT VOLTAGE 3 Ø LOW	AGENCY APPROVAL
SLA-120-AFN	120	Fixed	100	108	c UL us
SLA-208-AFN	208	Fixed	173	187	
SLA-220-AFN	220	Fixed	183	198	
SLA-240-AFN	240	Fixed	199	216	

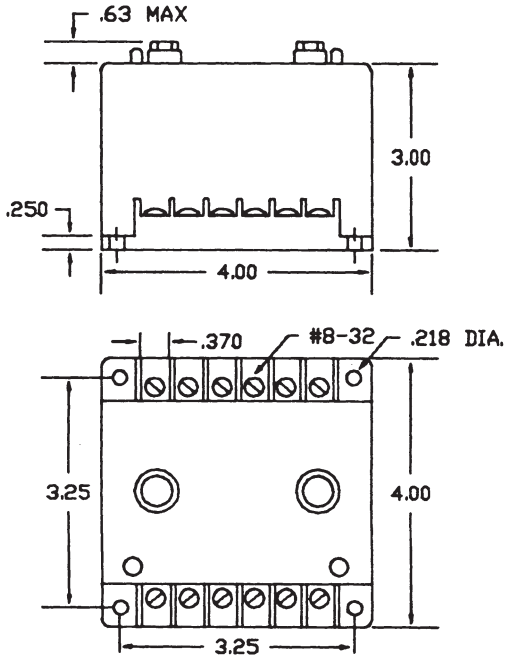
All voltage referenced are phase-to-phase.



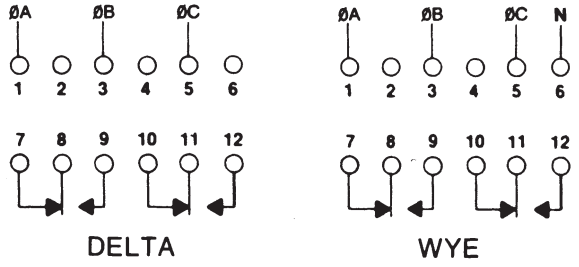
C UL US
LISTED
IND. CONT. EQ
496Y

3-Phase Voltage Band Monitor

DIMENSIONS (INCHES)



WIRING



The **PBC Series** offers protection to three-phase equipment that is required to operate between two voltage limits. All three phases are monitored individually for a pre-selected **UNDER** and **OVER VOLTAGE** limit.

OPERATION

With normal operating voltages applied, the internal relay will energize (PICK-UP). When the voltages on any or all phases fall outside the pre-set Over/Under trip points for longer than the Release delay, the relay will de-energize (DROP-OUT). When line conditions return to normal, the PBC Series Monitor automatically resets and the internal relay energizes.

The LED fault indicators aid in set up and system trouble-shooting glowing on fault condition. The LED indicators have an immediate response to voltage conditions and operate independently of the relay.

The HYSTERESIS in each unit provides a differential of 4% between the PICK-UP and DROP-OUT trip points.

The PBC Series is UL Listed under UL File Number E55826.

SPECIFICATIONS

OUTPUT RATING	DPDT, 3 Amps @ 600 VAC, Resistive; 360 VA @ 600 VAC, Inductive; 1/2 hp	
POWER REQUIRED	Models Up to 300 VAC	7 VA, Max
	Models Over 300 VAC	6 VA, Max
RESET	Automatic	
HYSTERESIS	4%	
REPEAT ACCURACY	0.1% @ Fixed Condition	
INDICATORS LED	Glows On Fault; (1) For Over, (1) For Under	
RESPONSE TIMES	Operate	100 mSEC
	Release	0.5 SEC
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
WEIGHT	20 oz.	

DELTA CONNECTED

MODEL NUMBER	MAXIMUM VOLTAGE	ADJUSTABLE RANGES UNDER	OVER
PBC-120-ALE	155 VAC	90-120	120-150
PBC-230-ALE	275 VAC	185-240	208-265
PBC-400-ALE	485 VAC	325-385	415-475
PBC-440-ALE	550 VAC	390-480	440-540
PBC-480-ALE	570 VAC	400-490	460-560
PBC-575-ALE	700 VAC	500-610	540-690

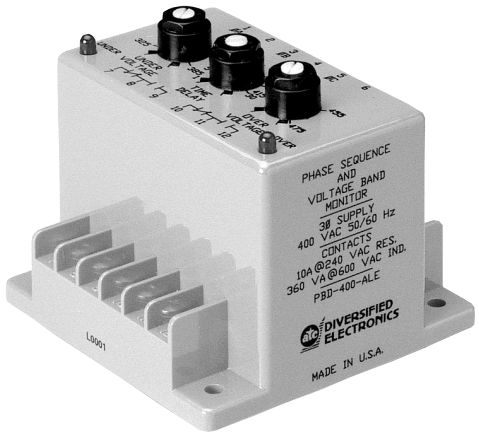
All voltages referenced on this page are phase-to-phase, unless otherwise indicated.

WYE CONNECTED

MODEL NUMBER	MAXIMUM VOLTAGE	ADJUSTABLE RANGES (Phases to Neutral) UNDER	OVER
PBC-120/208-ALE	268 VAC	90-120	120-150
PBC-220/380-ALE	450 VAC	185-220	220-255
PBC-277/480-ALE	565 VAC	235-277	277-320

All voltages referenced on this page are phase-to-phase, unless otherwise indicated.

The **PBD Series** offers protection to three-phase sequence sensitive equipment that is required to operate between two voltage limits. All three phases are monitored individually for a pre-selected **UNDER** and **OVER VOLTAGE** limit, with adjustable release delay.



c UL us
LISTED
IND. CONT. EQ
496Y

OPERATION

With normal operating voltages applied in the proper ABC sequence, the internal relay will energize (PICK-UP). When the voltages on any or all phases fall outside the preset Over/Under trip points for longer than the Adjustable Release delay, the relay will de-energize (DROPOUT). When line conditions return to normal, the PBD Series Monitor automatically resets and the internal relay energizes.

Both Delta and Wye systems may be monitored. In Wye systems, connections to neutral are not required.

The LED fault indicators aid in set up and system troubleshooting, and glow on fault condition. The LED indicators have an immediate response to voltage conditions and operate independently of the relay. In a phase reversal condition the LED responds to voltage conditions but the relay will NOT energize.

The Adjustable Release Delay is provided to ignore momentary voltage fluctuations that cause nuisance tripping.

The HYSTERESIS in each unit provides a differential of 4% between the PICK-UP and DROP-OUT trip points.

The PBD Series is UL Listed under UL File Number E55826.

SPECIFICATIONS

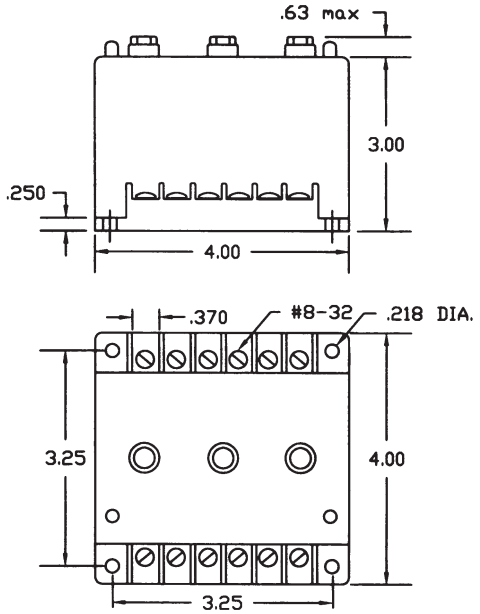
OUTPUT RATING	DPDT, 3 Amps @ 600 VAC, Resistive; 360 VA @ 600 VAC, Inductive; 1/2 hp	
POWER REQUIRED	Models Up to 300 VAC	7 VA, Max
	Models Over 300 VAC	6 VA, Max
RESET	Automatic	
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
HYSTERESIS	4%	
REPEAT ACCURACY	0.1% @ Fixed Condition	
INDICATORS LED	Glows On Fault; (1) For Over, (1) For Under	
RESPONSE TIMES	Operate	100 mSEC
	Release	0.1 to 30 SEC, Adjustable
TEMPERATURE RATING	Operate	32° to +104°F (0° to +40°C)
	Storage	-49° to 185°F (-45° to +85°C)
WEIGHT	19 oz.	

MODEL NUMBER	MAXIMUM VOLTAGE	ADJUSTABLE RANGES UNDER	OVER
PBD-120-ALE	155 VAC	90-120	120-150
PBD-230-ALE	275 VAC	185-240	208-265
PBD-400-ALE	485 VAC	325-385	415-475
PBD-440-ALE	550 VAC	390-480	440-540
PBD-480-ALE	570 VAC	400-490	460-560
PBD-575-ALE	700 VAC	500-610	540-690

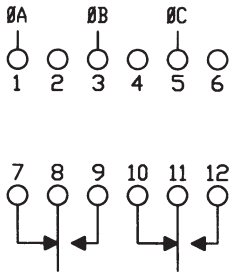
All voltages referenced on this page are phase-to-phase.

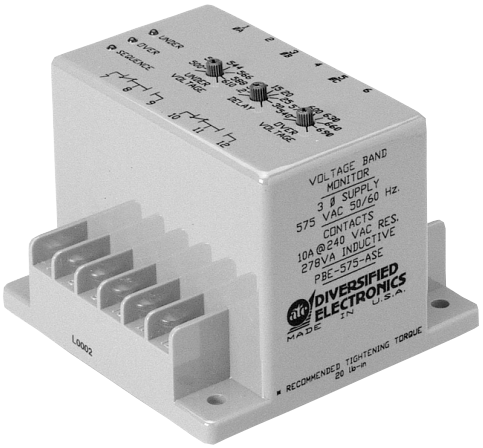
3 Phase Sequence & Voltage Band Monitor/Relays

DIMENSIONS (INCHES)



WIRING

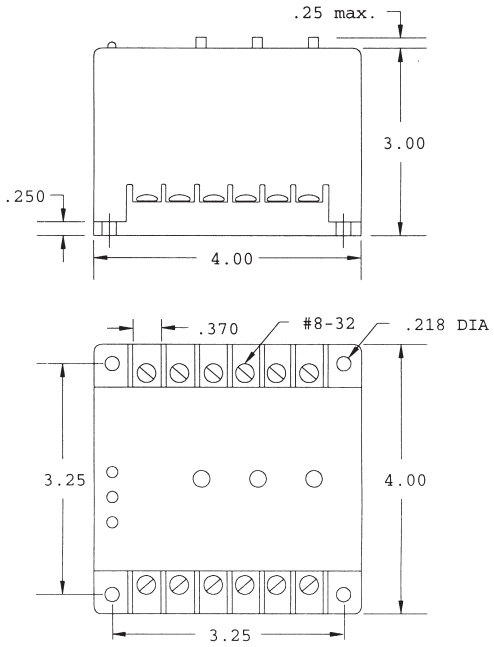




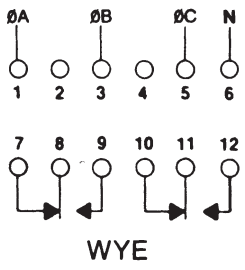
c UL us
LISTED
IND. CONT. EQ
496Y

True RMS Voltage Band Monitor

DIMENSIONS (INCHES)



WIRING



WYE

In today's industrial environment, Line Noise and Power Line Harmonics are becoming an increasing problem. **TRUE-RMS** detection may be necessary for achieving accurate Line Voltage measurement.

OPERATION

With normal operating voltages applied in the proper ABC sequence, the internal relay will energize (PICK-UP). When the voltages on any or all phases fall outside the preset Over/Under trip points for longer than the Drop-Out Time delay, the relay will de-energize (DROP-OUT). When line conditions return to normal, the PBE Series Monitor automatically resets and the internal relay energizes.

The PBE Series is UL Listed under UL File Number E55826.

SPECIFICATIONS

OUTPUT RATING	DPDT, 10 Amps Resistive, 1/4 HP @ 240 VAC	
RESET	Automatic	
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
HYSTERESIS	2%	
REPEAT ACCURACY	0.1% @ Fixed Condition	
INDICATORS LED	Glows On Fault; (1) For Over, (1) For Under, (1) For Sequence	
RESPONSE TIMES	Operate	200 mSEC (approx.)
	Release	0.2 to 30 SEC, Adjustable
TEMPERATURE RATING	Operate	32° to +104°F (0° to +40°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style "E" LEXAN® Surface Mount	
WEIGHT	14 oz.	

DELTA CONNECTED

MODEL NUMBER	MAXIMUM VOLTAGE	ADJUSTABLE RANGES UNDER	OVER
PBE-120-ASE	155 VAC	90-120	120-150
PBE-230-ASE	275 VAC	185-240	208-265
PBE-400-ASE	485 VAC	325-385	415-475
PBE-440-ASE	550 VAC	390-480	440-540
PBE-480-ASE	570 VAC	400-490	460-560
PBE-575-ASE	700 VAC	500-610	540-690

All voltages referenced on this page are phase-to-phase, unless otherwise indicated.

WYE CONNECTED

MODEL NUMBER	MAXIMUM VOLTAGE	ADJUSTABLE RANGES (Phase to Neutral) UNDER	OVER
PBE-120/208-ASE	160 VAC, P to N 277 VAC, P to P	90-120	120-150
PBE-220/380-ASE	260 VAC, P to N 450 VAC, P to P	185-220	220-255
PBE-277/480-ASE	326 VAC, P to N 565 VAC, P to P	235-277	277-320

All voltages referenced on this page are phase-to-phase, unless otherwise indicated.

The **SLB Series** is designed to protect three-phase equipment against **PHASE UNBALANCE, PHASE LOSS,** and **PHASE REVERSAL** conditions.

OPERATION

With normal operating voltages in the proper ABC sequence and the 120 VAC control voltage applied, the internal relay will energize (PICK-UP). When any combination of Phase Unbalance exceeding the preset value or Phase Loss or Phase Reversal occurs for longer than the preset drop out time, the output relay will de-energize (DROP-OUT). If the control voltage is removed, the relay will de-energize.

The wide input voltage range permits use on any one of several standard line voltages without recalibrating. The unbalance detection level is adjustable from 2% to 15%.

Both Delta and Wye systems may be monitored. In Wye systems, connections to neutral are not required.

The LED indicator glows when conditions are normal.

NOTE: A balanced condition exists and the output relay will energize when there is a complete absence of voltage on all three phases (Terminals 1, 3 and 5) and the control voltage is continuously applied to (Terminals 11 and 12). For this reason, the SLB series is ideally suited for **LOAD SIDE MONITORING APPLICATIONS**.

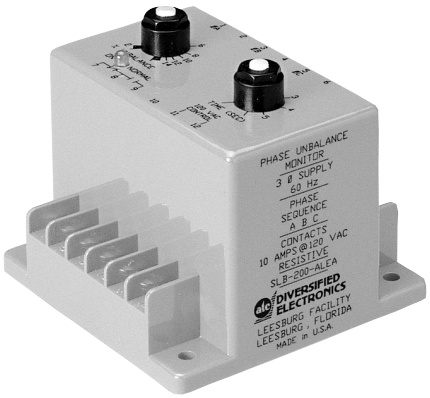
SPECIFICATIONS

OUTPUT RATING	SPDT, 10 Amps @ 120 VAC, 5 Amps @ 240 VAC, Resistive	
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
OPERATING VOLTAGE	See Table Below	
CONTROL VOLTAGE	120 VAC, 1 Phase, 60 Hz	
POWER REQUIRED	3 VA, Max.	
PHASE UNBALANCE RANGE	2% to 15%, Adjustable	
INDICATORS LED	Glows When All Conditions Are Normal	
RESPONSE TIMES	Operate	60 mSEC, Fixed
	Release	0.1 to 5 SEC, Adjustable
TEMPERATURE RATING	Operate	32° to +104°F (0° to +40°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style "E" LEXAN® Surface Mount	
WEIGHT	1 lb. 2 oz.	

The SLB Series will not detect an equal and simultaneous reduction in voltage on all three lines (Brown Out).

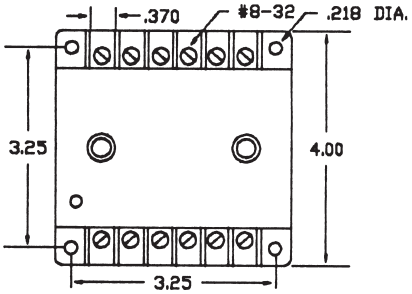
MODEL NUMBER	OPERATING VOLTAGE	RESET	HYSTERESIS
SLB-200-ALEA	Standard 0-300; 3 Ø Line Voltages 60 Hz.	Automatic	10% of Unbalance Setting
SLB-200-ALER		Manual	None
SLB-400-ALEA	Standard 300-500; 3 Ø Line Voltages 60 Hz	Automatic	10% of Unbalance Setting

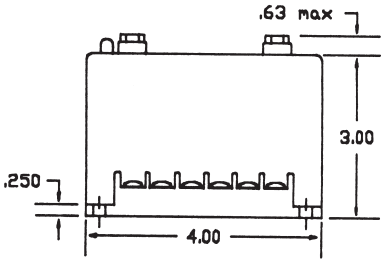
All voltages referenced on this page are phase-to-phase.



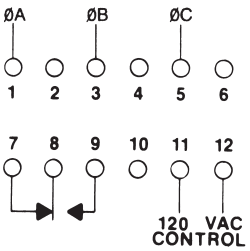
Phase Unbalance Monitor

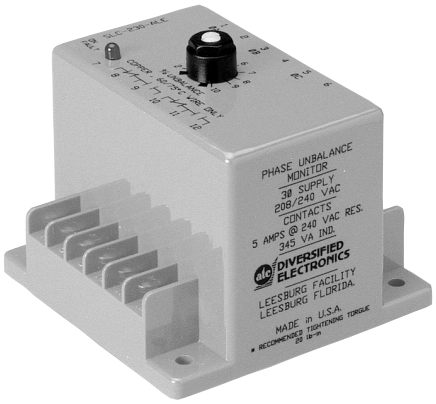
DIMENSIONS (INCHES)





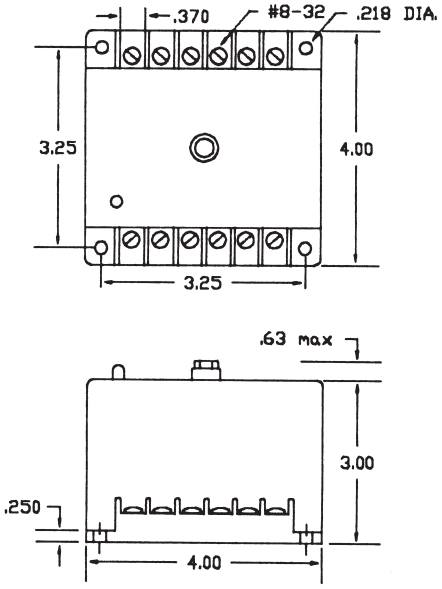
WIRING



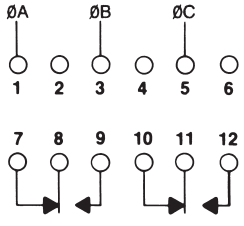


Phase Unbalance & Loss Monitor

DIMENSIONS (INCHES)



WIRING



The **SLC Series** is designed to protect 3-phase equipment against Phase **UNBALANCE** and **PHASE LOSS** conditions.

OPERATION

With normal operating voltages applied to all three phases, the internal relay will remain de-energized (DROPPED-OUT).

When a Phase Loss or Phase Unbalance exceeding the pre-selected trip point occurs, the relay will energize (PICK-UP). The SLC series is typically used in conjunction with a **SHUNT TRIP BREAKER**.

Both Delta and Wye systems may be monitored. In Wye systems, connections to neutral are not required.

NOTE: When a phase is lost while the motor is running, a condition known as regeneration occurs where a voltage is induced into the open phase nearly equal in magnitude to the normal phase-to-phase voltage. The SLC series is designed to detect this condition when properly adjusted.

SPECIFICATIONS

OPERATING VOLTAGE	See Table Below	
TRANSIENT PROTECTION	1000 Volts For 8 mSEC	
RESET	Automatic	
PHASE UNBALANCE RANGE	2% to 10%, Adjustable	
INDICATORS LED	Glows On Fault Condition	
RESPONSE TIMES	Operate	0.08 SEC
	Release	0.7 SEC
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
U.S. PATENT NUMBER	4,331,995	
WEIGHT	12.5 oz.	

MODEL NUMBER	OPERATING VOLTAGE	POWER REQUIRED	OUTPUT RATING
SLC-120-ALE	120 VA	3 VA Max.	DPDT, 5 Amps, Resistive; 345 VA, Inductive @ 240 VAC
SLC-230-ALE	208/240 VAC		
SLC-380-ALE	380 VAC	7 VA Max.	DPDT, 3 Amps, Resistive; 360 VA, Inductive @ 600 VAC
SLC-440-ALE	440/480 VAC		

All voltages referenced on this page are phase-to-phase.

The **SLD Series** is designed to protect 3-phase equipment against **PHASE UNBALANCE, PHASE LOSS, UNDER VOLTAGE** and **PHASE REVERSAL** conditions.

OPERATION

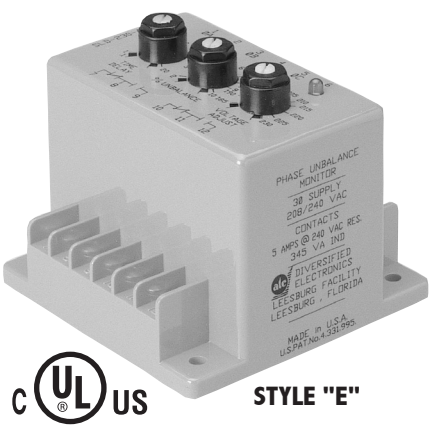
With normal operating voltage present on all three phases in the proper phase sequence, the internal relay will energize (PICK-UP). When an incorrect phase sequence or phase loss occurs or the three-phase line voltages fall outside the preset unbalance or under voltage settings, the internal relay will de-energize (DROP-OUT). When all conditions return to normal, the relay will reset.

The Adjustable Release Delay is provided to ignore momentary voltage fluctuations that cause nuisance tripping. 20% or > instantaneous trip

Both Delta and Wye systems may be monitored. In Wye Systems, connections to neutral are not required.

NOTE: When a phase is lost while the motor is running, a condition known as regeneration occurs where a voltage is induced into the open phase nearly equal in magnitude to the normal phase-to-phase voltage. The SLD series is designed to detect this condition when properly adjusted.

The SLD Series is UL Listed under UL File Number E55826.



STYLE "E" STYLE "A"

c UL us LISTED IND. CONT. EQ. 496Y

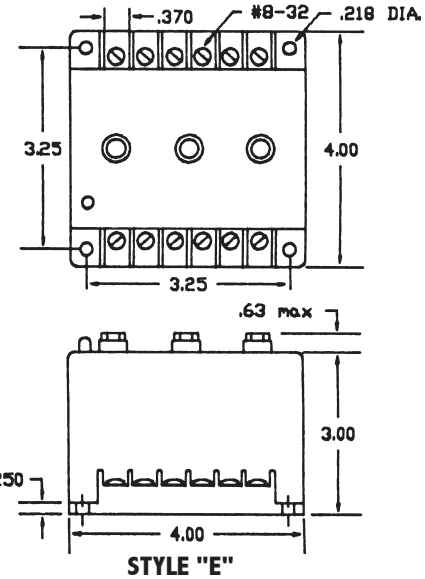
c UL® us

Phase & Under Voltage Monitor

SPECIFICATIONS

OPERATING VOLTAGE	See Table Below	
TRANSIENT PROTECTION	1000 Volts For 8 mSEC	
RESET	Automatic	
PHASE SEQUENCE	ABC (will not operate CBA)	
PHASE UNBALANCE RANGE	2% to 10%, Adjustable	
INDICATORS LED	Glows When All Conditions Are Normal	
RESPONSE TIMES	Operate	30 mSEC
	Release	0.1 to 20 SEC, Adjustable (on Under Voltage only); 100 mSEC on Phase Reversal and Unbalance
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
U.S. PATENT NUMBER	4,331,995	
WEIGHT	13.5 oz.	

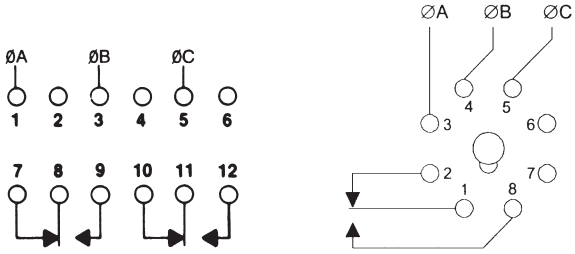
DIMENSIONS (INCHES)



STYLE "A"

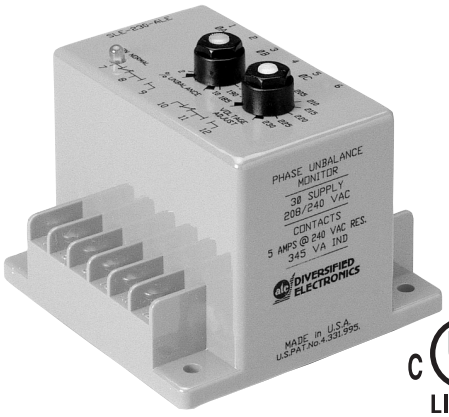
STYLE "E"

WIRING



MODEL NUMBER	OPERATING VOLTAGE	UNDER VOLTAGE DROPOUT RANGE	POWER REQUIRED	HYSTERESIS	OUTPUT RATING	ENCLOSURE
SLD-120-ASA	120 VAC	95-115 Adj.	3 VA Max.	2.5 VAC	SPDT, 10 Amp, Resistive @ 240 VAC 1/2 HP @ 240 VAC	A
SLD-230-ASA	208/240 VAC	185-230 Adj.		5.0 VAC		
SLD-380-ASA	380 VAC	315-390 Adj.		10 VAC		
SLD-440-ASA	440/480 VAC	370-460 Adj.				
SLD-120-ALE	120 VAC	95-115 Adj.		5 VAC	DPDT, 5 Amps, Resistive; 345 VA, Inductive @ 240 VAC	E
SLD-230-ALE	208/240 VAC	185-230 Adj.				
SLD-380-ALE	380 VAC	315-390 Adj.	7 VA Max	10 VAC	DPDT, 3 Amps, Resistive; 360 VA, Inductive @ 600 VAC	
SLD-440-ALE	440/480 VAC	370-460 Adj.				

All voltage referenced are phase-to-phase.



c UL us
LISTED
IND. CONT. EQ.
496Y

Phase Monitor

- Models Available up to 480 VAC

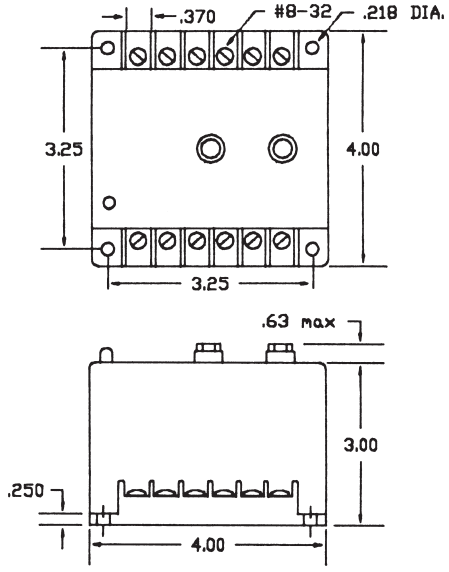
PROTECTS 3-PHASE EQUIPMENT AGAINST:

- Phase Loss
- Under Voltage
- Phase Unbalance

LOCK SHAFT ADJUSTMENT FOR:

- Phase Unbalanced Percent
- Under Voltage Drop Out
- Automatic Reset
- Delta or Wye Systems

DIMENSIONS
(INCHES)



The **SLE Series** is designed to protect 3-phase equipment against **PHASE UNBALANCE, PHASE LOSS,** and **UNDER VOLTAGE**.

OPERATION

With normal operating voltage present on all three phases, the internal relay will energize (PICK-UP). When a phase loss occurs or the voltages fall outside the preset unbalance or under voltage settings, the internal relay will de-energize (DROP-OUT). The relay automatically resets when the line conditions return to normal.

Both Delta and Wye systems may be monitored. In Wye Systems, connections to neutral are not required.

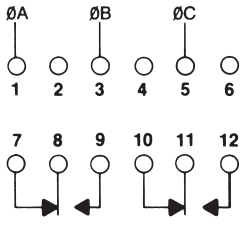
NOTE: When a phase is lost while the motor is running, a condition known as regeneration occurs where a voltage is induced into the open phase nearly equal in magnitude to the normal phase-to-phase voltage. The SLE series is designed to detect this condition when properly adjusted.

The SLE Series is UL Listed under UL File Number E55826

SPECIFICATIONS

OPERATING VOLTAGE	See Table Below	
TRANSIENT PROTECTION	1000 Volts For 8 mSEC	
RESET	Automatic	
PHASE UNBALANCE RANGE	2% to 10%, Adjustable	
INDICATORS LED	Glows When All Conditions Are Normal	
RESPONSE TIMES MODELS UP TO 300 VAC	Operate	60 Milliseconds
	Release	0.5 Seconds
RESPONSE TIMES MODELS OVER 300 VAC	Operate	1 Second
	Release	2 Seconds
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
U.S. PATENT NO.	4,331,995	
WEIGHT	12.5 to 13 oz.	

WIRING



MODEL NUMBER	OPERATING VOLTAGE	UNDER VOLTAGE DROPOUT RANGE	POWER REQUIRED	HYSTERESIS	OUTPUT RATING
SLE-120-ALE	120 VAC	95-115 Adj.	3 VA Max.	5.0 VAC	DPDT, 5 Amps, Resistive; 345 VA, Inductive @ 240 VAC
SLE-230-ALE	208/240 VAC	185-230 Adj.			
SLE-380-ALE	380 VAC	315-390 Adj.	7 VA Max.	10 VAC	DPDT, 3 Amps, Resistive; 360 VA, Inductive @ 600 VAC
SLE-440-ALE	440/480 VAC	370-460 Adj.			

All voltage referenced are phase-to-phase.

The **SLH Series** is designed to protect equipment against **PHASE LOSS** (single phasing), **UNDER VOLTAGE** (brown outs), and **PHASE REVERSAL** (improper sequence).

OPERATION

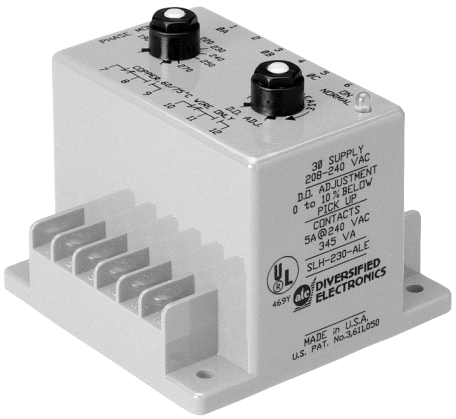
When correct phase sequence and line voltage are present, the internal relay of the SLH will energize (PICK UP). When there is a phase loss, under voltage or phase reversal condition, the internal relay will de-energize (DROP-OUT). When conditions return to normal, the SLH will automatically reset.

The SLH is unique in that it has a field-adjustable hysteresis. The voltage setting is adjusted to the desired pick-up point indicated by the dial setting. Then, the hysteresis adjustment is set to the desired percentage to achieve the preferred drop-out point. When models up to 300 VAC are set at 0%, they will pick-up and drop-out at the same point, when set at 10%, the drop-out will be an average of the phase-to-phase voltages 10% below the dial setting pick-up point. Models over 300 VAC are adjustable from 0% to 15%.

The SLH is available in the standard voltage ranges (see table below). It has an LED indicator that glows when all conditions are normal. The SLH Series is UL Listed under UL File Number E55826.

SPECIFICATIONS

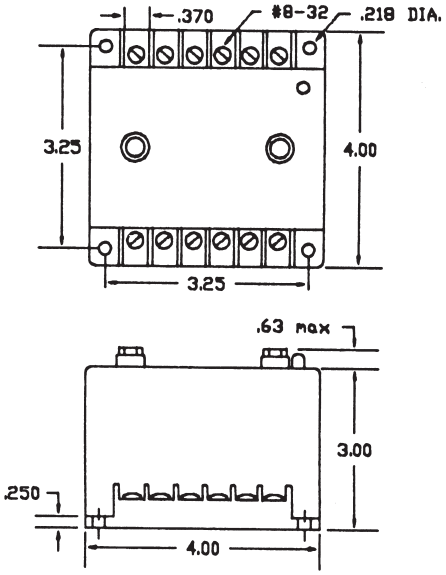
OPERATING VOLTAGE	See Table Below	
POWER REQUIRED	See Table Below	
RESET	Automatic	
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
HYSTERESIS	Models Up to 300 VAC	Adjustable, 0% to 10% Below Pick-up
	Models Over 300 VAC	Adjustable, 0% to 15% Below Pick-up
OUTPUT RATING	Models Up to 300 VAC	DPDT, 10 Amps @ 120 VAC, Resistive; 211 VA @ 120 VAC, Inductive
	Models Over 300 VAC	DPDT, 5 Amps @ 240 VAC, Resistive; 345 VA @ 240 VAC, Inductive
TERMINATIONS	(12) #8-32 Screw Terminals	
INDICATORS LED	Glows when all conditions are normal	
RESPONSE TIMES	See table below	
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
WEIGHT	14 oz.	



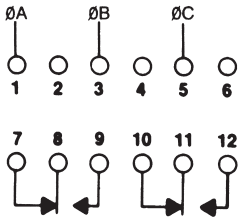
c UL us
LISTED
IND. CONT. EQ.
496Y

Phase, Under Voltage Monitor with Adjustable Hysteresis

DIMENSIONS (INCHES)

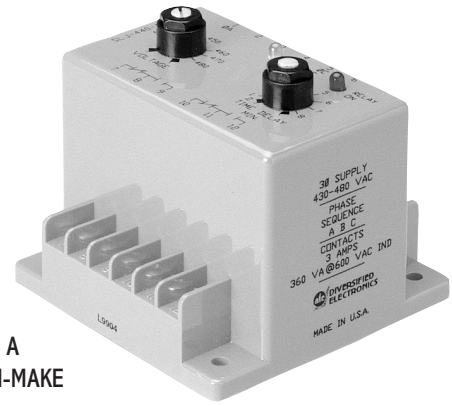


WIRING



MODEL NUMBER	PICK UP VOLTAGE	RESPONSE TIMES OPERATE	RESPONSE TIMES RELEASE	OUTPUT RATING
SLH-120-ALE	95-130 V. Adj.	80 m. SEC	0.5 SEC	3 VA
SLH-230-ALE	190-270 V. Adj.	150 m. SEC	0.5 SEC	3 VA
SLH-440-ALE	430-480 V. Adj.	1.0 SEC	2.0 SEC	7 VA

All voltage referenced are phase-to-phase.



INCLUDES A DELAY-ON-MAKE TIMER

Phase & Under Voltage Monitor

The **SLJ Series** has a built-in Delay-on-Make Time Delay. The SLJ continuously monitors the three phase lines for adverse conditions such as **PHASE LOSS** (single phasing), **UNDER VOLTAGE** (brown outs), and **PHASE REVERSAL** (improper sequence). When any of these conditions occur, the internal relay will de-energize (DROP-OUT). When the fault is corrected, the field adjustable Delay-on Make delay begins. Upon completion of the time delay, the internal relay will energize (PICK-UP). Any subsequent interruptions will reset the delay period.

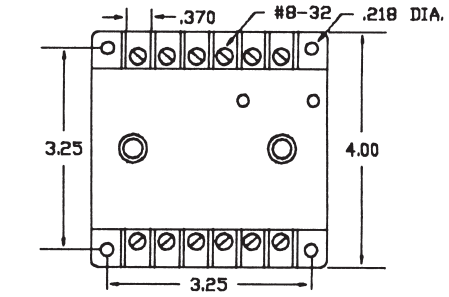
The SLJ's phase monitor operates the same as the SLA Series. It will drop-out for a phase loss if any phase drops below 83% of its nominal setting and it will also drop-out for under voltage if all three phases drop below 90% of its nominal setting. It is phase sequence sensitive and will not allow start-up if the three phases are reversed.

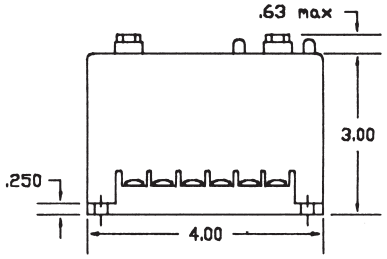
The SLJ is available in the same standard operating voltage ranges as our other Phase Monitors (see table below). The Delay-on-Make Timer is field adjustable from 0.2 to 8.0 minutes.

There are two LED indicators. The green indicator glows when all conditions are normal, and the red indicator glows when the internal relay is energized.

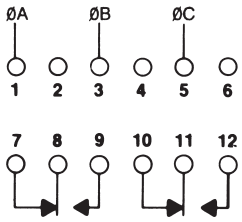
The SLJ is ideally suited for multiple equipment installations to stagger start equipment after a fault condition.

DIMENSIONS (INCHES)





WIRING



SPECIFICATIONS

OPERATING VOLTAGE	See Table Below	
OUTPUT RATING	See Table Below	
INDICATORS LED	Green LED	Glows When All Conditions Are Normal
	Red LED	Glows When Relay is Energized
RESPONSE TIMES	Operate	0.2 to 8.0 Minutes, Adjustable
	Release	See Table Below
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style "E" Lexan, Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	14 oz.	

MODEL NUMBER	OPERATING VOLTAGE	DROP-OUT 1 Ø LOW	DROP-OUT 3 Ø LOW	PICK-UP	DELAY-ON RELEASE	OUTPUT RATING
SLJ-120-ALE	95-130 V. Adj.	79-108 V	85-117 V	1 Volt Above Drop-out	0.5 Sec	DPDT, 345 VA Inductive; 10 Amps Resistive @ 240 VAC
SLJ-230-ALE	190-270 V. Adj.	158-224 V	171-243 V			
SLJ-380-ALE	350-440 V. Adj.	290-365 V	315-396 V		2.0 Sec	DPDT, 360 VA Inductive; 3 Amps Resistive @ 600 VAC
SLJ-440-ALE	430-480 V. Adj.	357-398 V	387-432 V			

All voltage referenced are phase-to-phase.

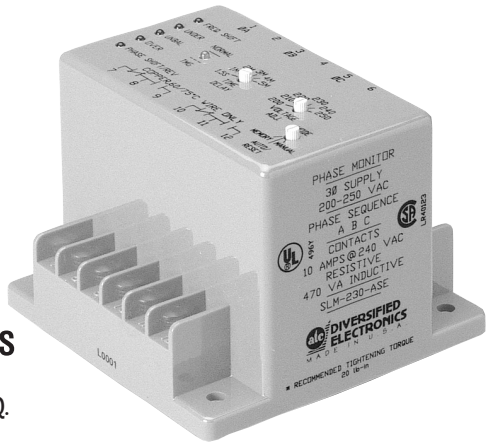
- Models available up to 690 VAC
- Automatic or Manual Reset
- Delay-on-Make Timer
- LED Indicators for Fault Conditions
- Last Fault Memory

SCREWDRIVER ADJUSTMENT FOR:

- Time Delay
- Voltage
- Mode of Operation

PROTECTS 3-PHASE EQUIPMENT AGAINST:

- Under Voltage
- Over Voltage
- Phase Loss
- Phase Reversal
- Phase Unbalance
- Phase Shift
- Frequency Shift



c UL us
LISTED
IND. CONT. EQ.
496Y

Microprocessor Based 3-Phase Monitor

SPECIFICATIONS

VOLTAGE TRIP POINTS	Drop-Out	±10% of Setting
	Pick-Up	± 7% of Setting
FREQUENCY TRIP POINTS	Drop-Out	±4% of 60 Hz (380 V, 50 Hz)
	Pick-Up	±3% of 60 Hz (380 V, 50 Hz)
UNBALANCE TRIP POINTS	Drop-Out	7%
	Pick-Up	5%
RESET	Automatic; Manual; Automatic with Memory*	
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
OUTPUT RATING	DPDT, 360 VA Inductive; 1/2 hp 3 A Resistive @ 600 VAC	
TERMINATIONS	#8-32 Screw Terminals	

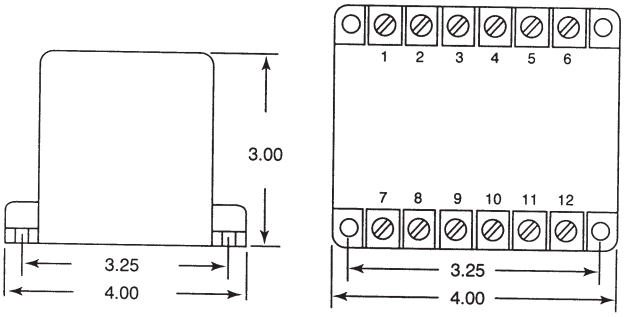
INDICATORS LED*

*Automatic with Memory MODE: The last fault is indicated and remains on when conditions return to normal. The indicator extinguishes only with reset or when new fault condition occurs.

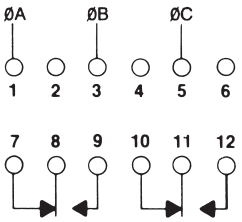
Designation	Color	State	Condition
Time Delay	Green	Flashing Normal ON	Timing Output Energized
Under Voltage	Red	ON	Fault
Over Voltage	Red	ON	Fault
Phase Sequence, Shift	Red	ON	Fault
Frequency Shift	Red	ON	Fault
Unbalance	Red	ON	Fault

	Operate	
	Sampling	2 SEC
	Reset Delay	(Sampling Delay) + (1.5 seconds to 5 minute Delay) Adjustable in one (1) minute increments
	Release	
	Under Voltage	1.5 SEC, (approx.)
	Over Voltage	1.5 SEC, (approx.)
	Frequency Shift	1.5 SEC, (approx.)
	Unbalance	2.0 SEC, (approx.)
	*Phase Loss/Shift	1.0 SEC, (approx.)
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
POWER REQUIRED	7 VA Typical	
TRANSIENT PROTECTION	2500 Volts for 10 ms	
ENCLOSURE	Lexan Surface Mounted	
WEIGHT	22 oz.	

DIMENSIONS (INCHES)



WIRING



DELTA

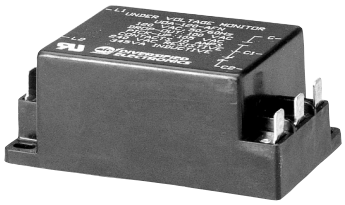
MODEL NUMBER	NOMINAL PHASE-TO-PHASE VOLTAGE SET POINTS	MAXIMUM VOLTAGE
SLM-120-ASE	105, 110, 115, 120, 125, 130	143 VAC
SLM-230-ASE	200, 210, 220, 230, 240, 250	275 VAC
SLM-380-ASE	350, 365, 380, 390, 400, 415	457 VAC
SLM-440-ASE	440, 450, 460, 470, 480, 490	540 VAC
SLM-575-ASE	525, 550, 575, 600	690 VAC

*Automatic with Memory MODE: The last fault is indicated and remains on when conditions return to normal.

The indicator extinguishes only with reset or when new fault condition occurs.

The SLM Series is UL Listed under UL File Number E55826.

STYLE "A"



STYLE "N"

Style A only

E55826

The **UOA Series** offers protection to **SINGLE PHASE** equipment that is required to operate above a certain voltage minimum.

OPERATION

With operating voltage applied above the preset PICK-UP voltage, the internal relay will energize. When the voltage falls below the preset DROP-OUT voltage for a period longer than the release delay, the output relay will de-energize. When line conditions return above the preset PICK-UP voltage, the UOA Series automatically resets and the internal relay energizes.

The HYSTERESIS in each unit provides a differential between the PICK-UP and DROP-OUT trip points.

Single Phase Under Voltage Monitor

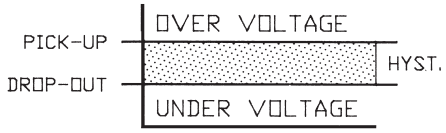
SPECIFICATIONS

OPERATING RATING	Style A	DPDT, 5A @ 240 VAC, Resistive; 211 VA @ 240, Inductive
	Style N	SPDT, 10A @ 240 VAC, Resistive; 180 VA, Inductive.
RESPONSE TIMES	Operate	50 mSEC. (approx.) (500 mSEC. on 12 VDC units)
	Release	0.5 SEC (approx.)
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
POWER REQUIRED	Models Up To 110 VDC: 3 Watts, Max. Models Up To 300 VAC: 5 VA, Max.	
WEIGHT	5 oz. to 5.5 oz.	

MODEL NUMBER	DROP-OUT VOLTAGE	PICK-UP VOLTAGE	HYSTERESIS VOLTAGE
UOA-24-A*A	19-27 VAC	21-29 VAC	2
UOA-120-A*A	97-130 VAC	102-135 VAC	5
UOA-208-A*A	177-222 VAC	185-230 VAC	8
UOA-240-A*A	205-250 VAC	215-260 VAC	10
UOA-12-D*A	9-14 VDC	10-15 VDC	1
UOA-24-D*A	19-27 VDC	21-29 VDC	2
UOA-48-D*A	38-53 VDC	40-55 VDC	2
UOA-110-D*A	92-125 VDC	97-130 VDC	5
UOA-220-D*A	185-230 VDC	194-239 VDC	9
UOA-240-D*A	205-250 VDC	215-260 VDC	10
UOA-120-AFN	100 VAC	105 VAC	5
UOA-208-AFN	180 VAC	188 VAC	8
UOA-220-AFN	180 VAC	187 VAC	7
UOA-230-AFN	190 VAC	198 VAC	8
UOA-240-AFN	202 VAC	210 VAC	8

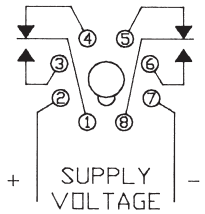
*Adjustments - F = Fixed
K = Knob
L = Locknut

WIRING



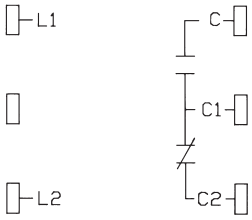
WIRING DIAGRAMS
(SHOWN IN DE-ENERGIZED STATE)

PLUG-IN MODEL
Style A



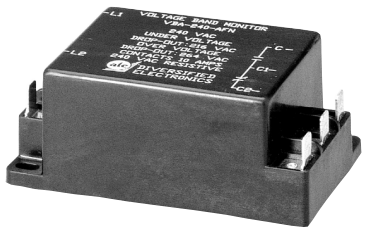
(DC POLARITY SHOWN)
RB-08 or PF083A

SURFACE MOUNTED
Style N



The **VBA Series** offers protection to **SINGLE PHASE** equipment that is required to operate between two voltage limits. Supply voltage is monitored for a preselected **UNDER** and **OVER** voltage limit.

STYLE "A"



STYLE "N"

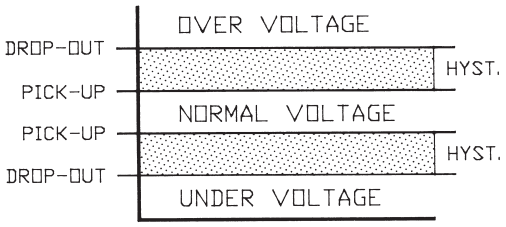
E55826
Style A only

OPERATION

With normal operating voltage applied, the internal relay will energize (PICK-UP). When the voltage falls outside the preset Over/Under trip points for longer than the release delay, the relay will de-energize (DROP-OUT). When line conditions return to normal, the VBA Series automatically resets and the internal relay energizes.

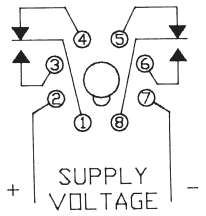
The HYSTERESIS in each unit on the Under and Over limits provides a differential between the PICK-UP and DROP-OUT trip points.

WIRING



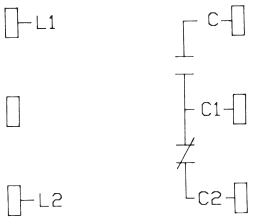
WIRING DIAGRAMS
(SHOWN IN DE-ENERGIZED STATE)

PLUG-IN MODEL
Style A



(DC POLARITY SHOWN)
RB-08 or PF083A

SURFACE MOUNTED
Style N



Single Phase Voltage Band Monitor

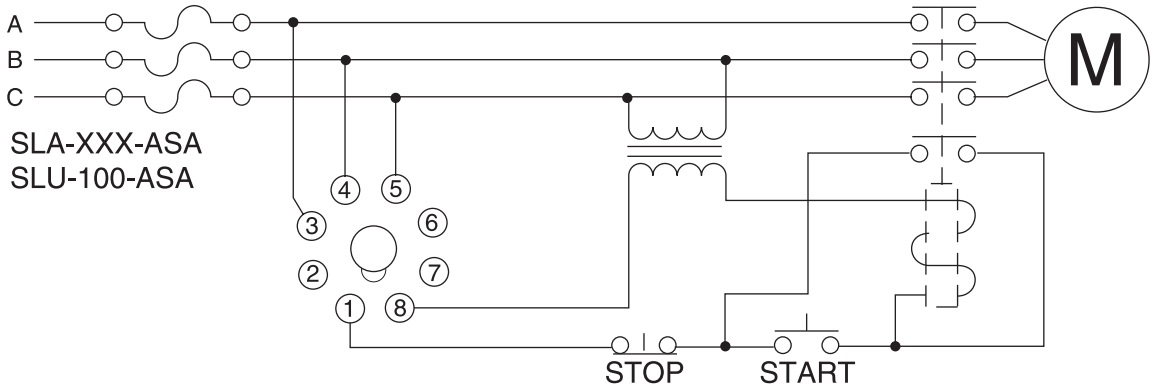
SPECIFICATIONS

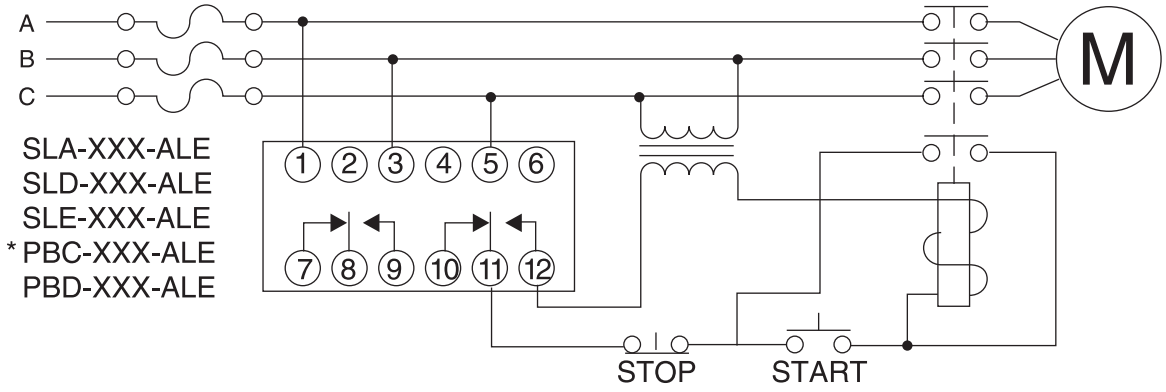
POWER REQUIRED	Models Up To 110 VDC: 3 Watts, Max. Models Up To 300 VAC: 5 VA, Max.	
OUTPUT RATING	Style A	DPDT, 5A @ 240 VAC, Resistive; 211 VA @ 240, Inductive
	Style N	SPDT, 10A @ 240 VAC, Resistive; 180 VA, Inductive.
RESPONSE TIMES	Operate	50 mSEC (approx.) (500 mSEC on 12 VDC units)
	Release	0.5 SEC (approx.)
TEMPERATURE RATING	Operate	32° to +131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
WEIGHT	5 oz.	

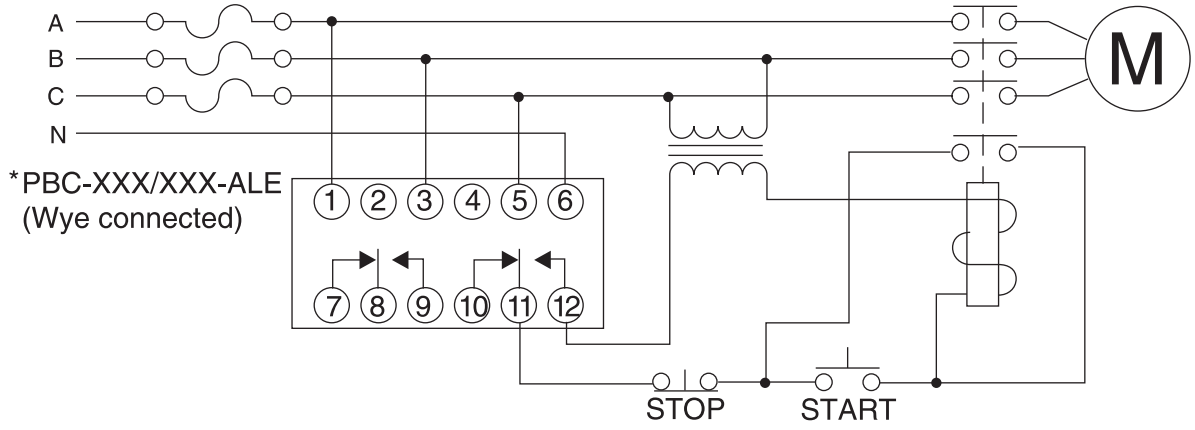
MODEL VOLTAGE	NOMINAL VOLTAGE	PICK-UP UNDER VOLTAGE	PICK-UP OVER VOLTAGE	HYSTERESIS VOLTAGE
VBA-24-A*A	24 VAC	19-24	24-29	2
VBA-120-A*A	120 VAC	90-120	120-150	5
VBA-208-A*A	208 VAC	185-208	208-240	8
VBA-240-A*A	240 VAC	200-240	240-270	10
VBA-12-D*A	12 VDC	10-12	12-15	1
VBA-24-D*A	24 VDC	19-24	24-29	1
VBA-28-D*A	28 VDC	22-28	28-34	1
VBA-48-D*A	48 VDC	38-48	48-58	2
VBA-110-D*A	110 VDC	85-110	110-135	5
VBA-24-AFN	24 VAC	21.6	26.4	0
VBA-120-AFN	120 VAC	108	132	0
VBA-208-AFN	208 VAC	187	229	0
VBA-220-AFN	208/240 VAC	198	242	0
VBA-230-AFN	230 VAC	207	253	0
VBA-240-AFN	240 VAC	216	264	0

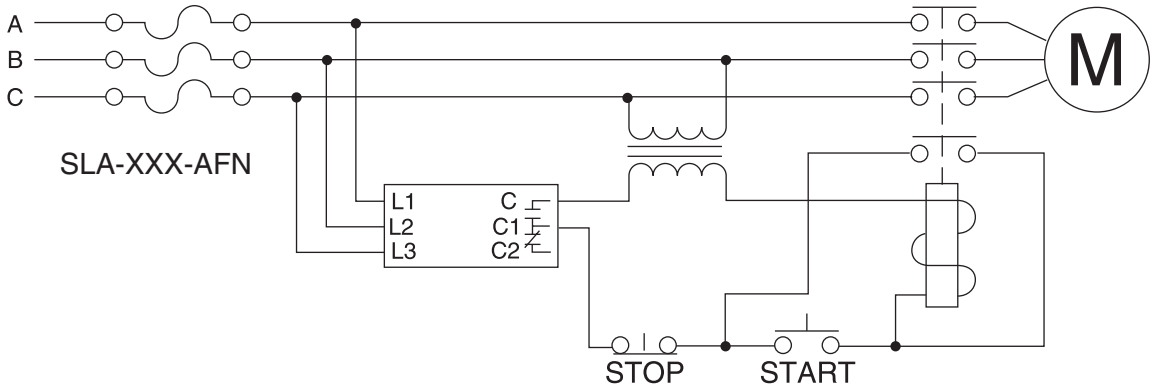
*Adjustments - F = Fixed
K = Knob
L = Locknut

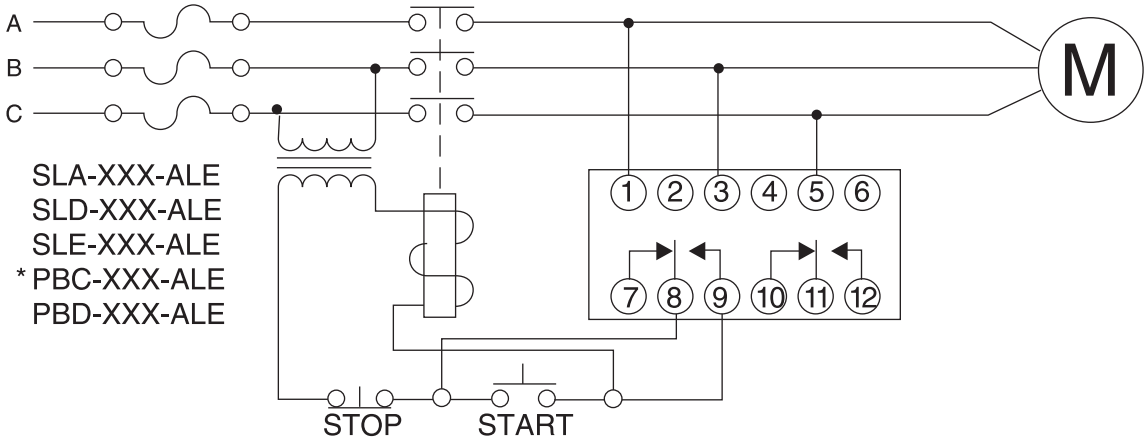
APPLICATION NOTES – WIRING DIAGRAMS

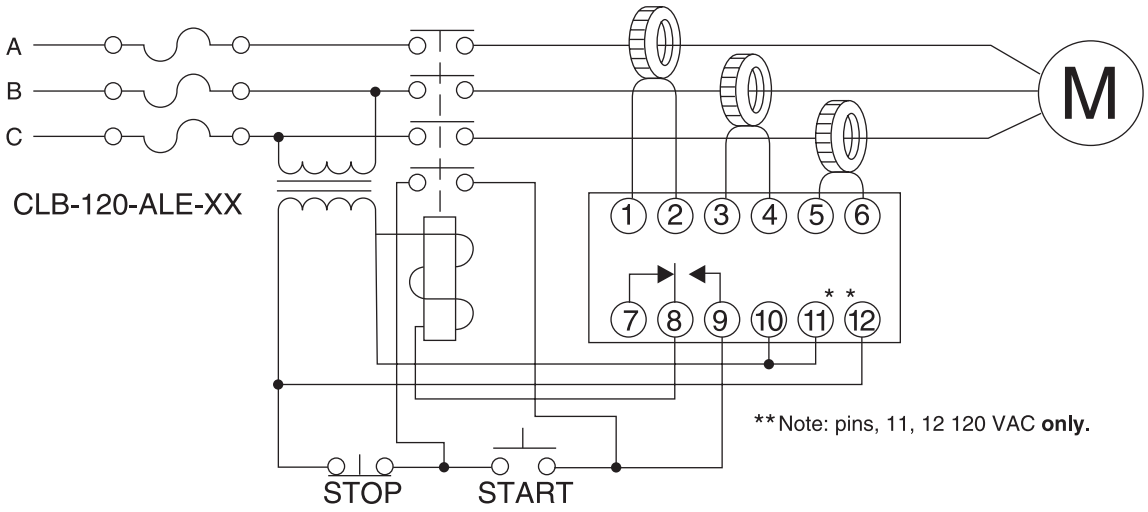







A
B
C
M
SLA-XXX-AFN
L1
L2
L3
C
C1
C2
STOP
START


A
B
C
M
SLA-XXX-ALE
SLD-XXX-ALE
SLE-XXX-ALE
* PBC-XXX-ALE
PBD-XXX-ALE
1 2 3 4 5 6
7 8 9 10 11 12
STOP
START


A
B
C
M
CLB-120-ALE-XX
1 2 3 4 5 6
7 8 9 10 11 12
* *
** Note: pins, 11, 12 120 VAC only.
STOP
START

CURRENT MONITORS

ATC-Diversified Electronics has a Current Monitor available to fit almost any monitoring application. The operation of the **CM Series**, AC Current Monitor/Relays, is based on an internal current transformer magnetically coupling the solid state sensing circuitry to the line being monitored. The operation of the **CD Series**, DC Current Monitor/Relays, is based on an internal Hall-effect device with a magnetic concentrator coupling the solid state sensing circuitry to the line being monitored. When the monitored current reaches a preset threshold point, an internal relay switches. The heavy duty contacts are used for instrumentation or signaling alarm circuits. The current sensing range of the ATC-Diversified Electronics AC Current Monitor/Relays can be increased by the use of an external Current Transformer. With the use of external Current Transformers you can monitor the current on almost any application. The feature matrix below shows the Current Monitor Series available from ATC-Diversified Electronics and highlights their features and specifications.

TYPICAL APPLICATIONS

The following are some typical applications for ATC-Diversified Electronics Current Monitors:

- Sense current demand level
- Run time totalizer
- Detect conveyor load jam
- Detect heater element failure
- Detect the use of dull bits or blades
- Detect runway lights and radio tower light failures
- Remote motor sensing
- Sense load loss
- Detect broken fan belts or chains

FEATURE MATRIX

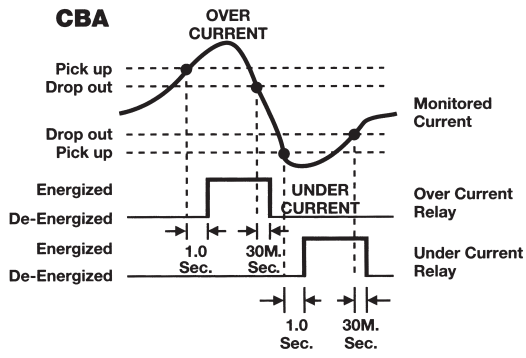
	SENSING FEATURES				CONTROL VOLTAGE			ADJUSTABLE CURRENT RANGE						ENCLOSURE			RESET		TIME DELAY					
SERIES	OVER CURRENT	UNDER CURRENT	THREE PHASE UNBALANCE	SELF POWERED	24 VDC	24 VAC	120 VAC	0.25 (0.05 TO 0.25 AMPS)	1 (0.2 TO 1.0 AMPS)	5 (1.0 TO 5.0 AMPS)	10 (2.0 TO 10 AMPS)	20 (4.0 TO 20.0 AMPS)	30 (6.0 TO 30 AMPS)	"A" STYLE PLUG-IN	"D" STYLE SURFACE MOUNT	"E" STYLE SURFACE MOUNT	AUTOMATIC	MANUAL	FIXED (OPERATE)	ADJUSTABLE (OPERATE)	FIXED (RELEASE)	ADJUSTABLE (RELEASE)	UL RECOGNIZED	UL RECOGNIZED FOR CANADA
CBA	●	●					●		●	●	●	●	●			●	●		●		●			
CDD	●	●					●		●	●	●	●				●	●			●		●		
CDO	●						●		●	●	●	●				●	●			●	●			
CDU		●					●		●	●	●	●				●	●		●			●		
CLB	●		●				●			●	●					●	●	●	●		●			
CMB	●					●	●		1-10 amps fixed					●			●		●		●		●	●
CMD	●	●			●	●	●	●	●	●	●	●				●	●			●		●		
CMG				●					20-36 amp fixed (0100 series only)						●		●		●		●		●	●
CMI	●					●	●	●	●	●	●	●				●		●	●		●			
CML	●				●	●	●	●	●	●	●	●		●		●		●		●	●			
CMO	●				●	●	●	●	●	●	●	●		●		●	●			●	●			
CMU		●			●	●	●	●	●	●	●	●		●		●	●		●			●		

The **CBA Series** is used to detect **UNDER** and **OVER CURRENT** conditions. When the monitored current is within the normal current band, both internal relays are de-energized (Drop-out). When the current rises above the over current setting for longer than 1.0 second, the over current relay energizes (Pick-up). If the current falls below the under current setting for longer than 1.0 second, the under current relay energizes. When the monitored current returns to normal, the relays will automatically reset. The over and under current trip points are independently adjustable.

An External CT may be used to extend the range of the Current Monitor.

CURRENT BAND MONITOR
SUPPLY VOLTAGE 120 VAC
INPUT CURRENT 1 TO 5 AMPS AC ADJUSTABLE
CONTACTS 10 AMPS 120 VAC RESISTIVE
CBA-120-ALE-5
DIVERSIFIED ELECTRONICS

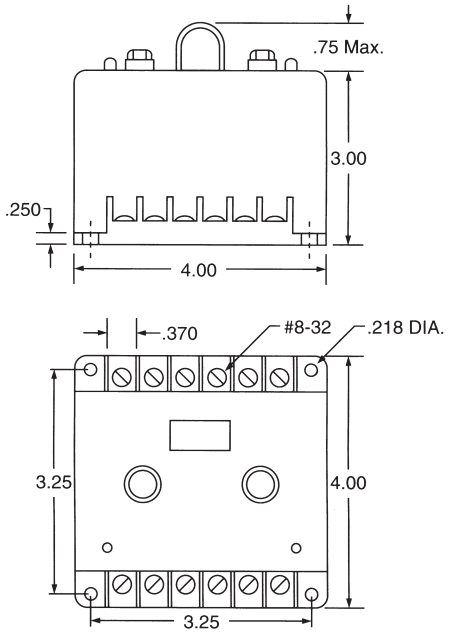
AC Current Band Monitor



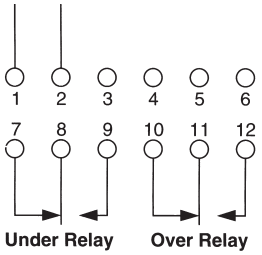
SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
TRIP POINTS	Over Current	
	Pick-up	See Table Below
	Drop-out	2% below Pick-up
	Under Current	
	Pick-up	See Table Below
	Drop-out	2% above Pick-up
OUTPUT	10 Amps @ 120 VAC, Resistive	
HYSTERESIS	2%	
RESPONSE TIME	Operate	1.0 SEC
	Release	30 mSEC
INDICATORS	LED's Show Over/Under Current Status	
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
CONTACT ARRANGEMENT	(2) Form C Contacts. One each for Over/Under	
ENCLOSURE	Lexan Surface Mounted; #8-32 Screw Terminals	
WEIGHT	16 oz.	

DIMENSIONS (INCHES)



WIRING

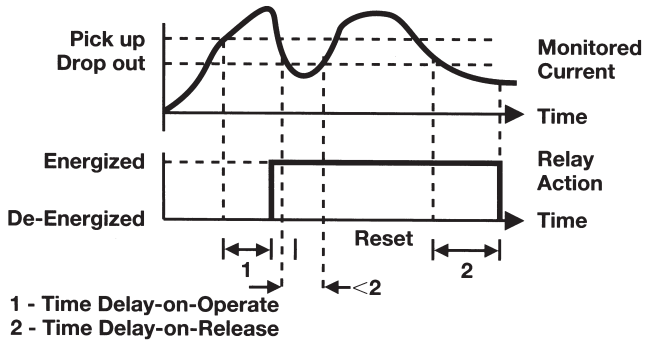


MODEL NUMBER	UNDER CURRENT RANGE	OVER CURRENT RANGE
CBA-120-ALE-1	0.2 to 1.0 amps, Adjustable	0.2 to 1.0 amps, Adjustable
CBA-120-ALE-5	1.0 to 5.0 amps, Adjustable	1.0 to 5.0 amps, Adjustable
CBA-120-ALE-10	2.0 to 10 amps, Adjustable	2.0 to 10 amps, Adjustable
CBA-120-ALE-20	4.0 to 20 amps, Adjustable	4.0 to 20 amps, Adjustable
CBA-120-ALE-30	6.0 to 30 amps, Adjustable	6.0 to 30 amps, Adjustable
CBA-120-ALE-40	8.0 to 40 amps, Adjustable	8.0 to 40 amps, Adjustable

Universal DC Current Monitor

The **CDD Series** may be used as an **OVER CURRENT** Monitor **OR** an **UNDER CURRENT** Monitor. The CDD has **adjustable Delay-on-Operate** and **adjustable Delay-on-Release** time delays. When the current exceeds the preset current trip point for longer than the Delay-on-Operate time delay, the internal relay will energize (Pick-up). When the current drops below the preset current trip point for longer than the Delay-on-Release time delay, the internal relay will de-energize (Drop-out). When used as an Over Current Monitor the Delay-on-Operate time delay is used to override inrush periods. When used as an Under Current Monitor, the Delay-on-Release timer is used to override a temporary under current condition.

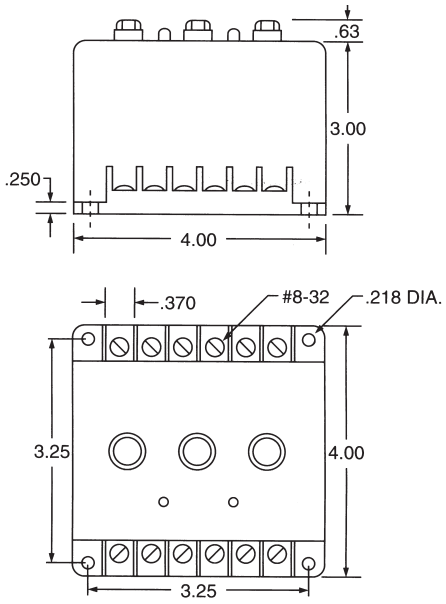
CDD



SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
TRIP POINTS	Over Current	
	Pick-up	See order information
	Drop-out	5% below Pick-up
OUTPUT	SPDT, 10 Amps @ 240 VAC Resistive	
HYSTERESIS	5%	
RESPONSE TIME	Operate	0.2 to 10 SEC, Adjustable
	Release	0.2 to 10 SEC, Adjustable
INDICATORS	Trip (Amber)	Glows when current is above the trip point
	Relay (Green)	Glows when Relay is energized
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Lexan Surface Mounted; #8-32 Screw Terminals	
WEIGHT	20 oz.	

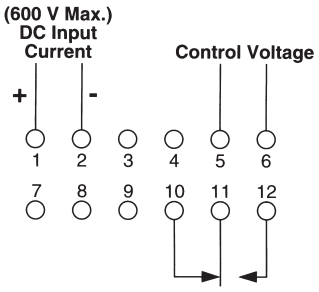
DIMENSIONS (INCHES)



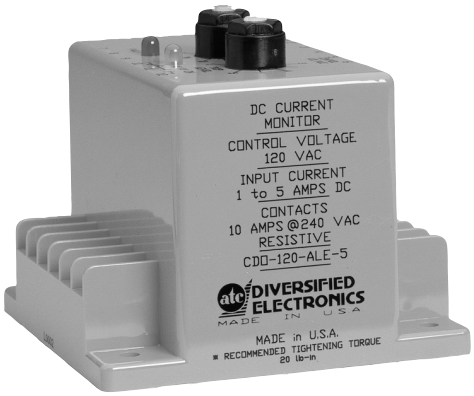
MODEL NUMBER

MODEL NUMBER	CDD	120	A	L	E	
CONTROL VOLTAGE						
120 Volts		120				
TYPE OF VOLTAGE						
AC			A			
ADJUSTMENT						
Lockshaft				L		
FEATURES						
0.2 to 1 amp adj.						1
0.5 to 2.5 amps adj.						2.5
1.0 to 5.0 amps adj.						5
2.0 to 10 amps adj.						10
4.0 to 20 amps adj.						20

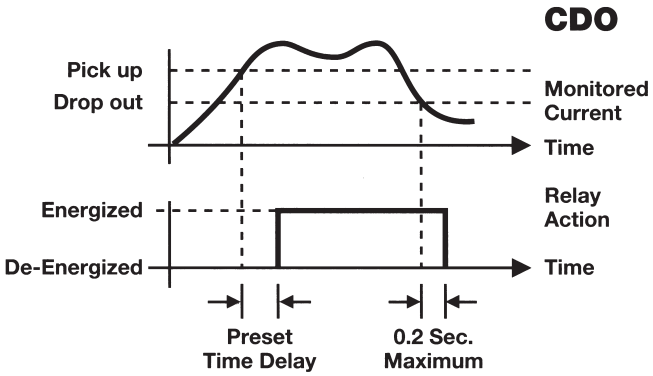
WIRING



The **CDO Series** is used to detect **OVER CURRENT** conditions. The internal relay energizes (Pick-up) when the monitored current exceeds the preset trip point for longer than the adjustable time delay. The delay is incorporated to prevent nuisance tripping caused by inrush currents. The CDO has an automatic reset feature. The internal relay de-energizes (Drop-out) when the current drops 5% below the preset trip for longer than 0.2 seconds.



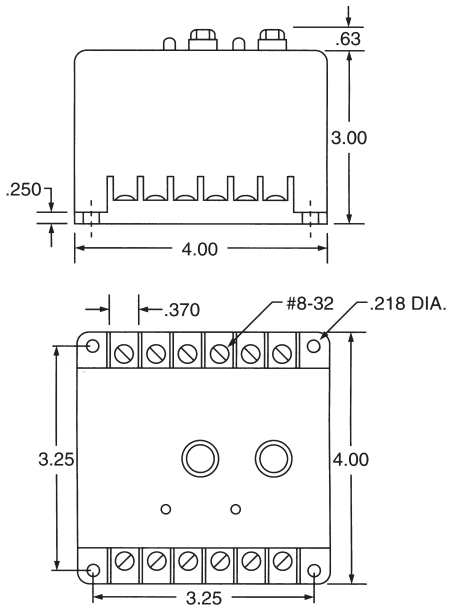
DC Over Current Monitor



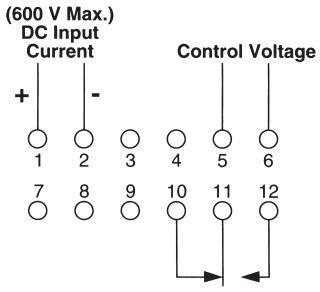
SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
TRIP POINTS	Over Current	
	Pick-up	See order information
	Drop-out	5% below Pick-up
OUTPUT	SPDT, 10 Amps @ 240 VAC Resistive	
HYSTERESIS	5%	
RESPONSE TIME	Operate	0.2 to 10 SEC, Adjustable
	Release	0.2 SEC.
INDICATORS	Trip (Red)	Glows On Over Current
	Relay (Green)	Glows when Relay is energized
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Lexan Surface Mounted; #8-32 Screw Terminals	
WEIGHT	17 oz.	

DIMENSIONS (INCHES)



WIRING



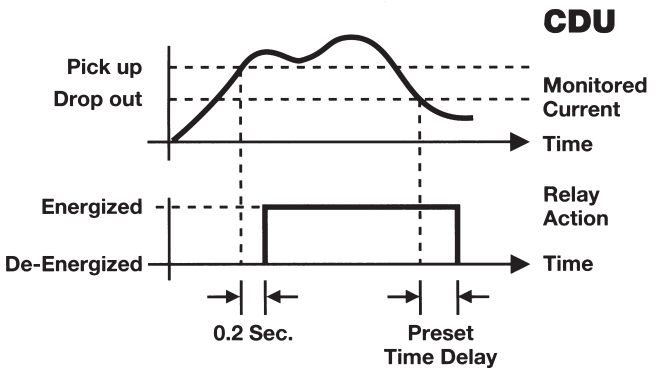
MODEL NUMBER

MODEL NUMBER	CDO	120	A	L	E	
CONTROL VOLTAGE						
120 Volts		120				
TYPE OF VOLTAGE						
AC			A			
ADJUSTMENT						
Lockshaft				L		
FEATURES						
0.2 to 1 amp adj.						1
0.5 to 2.5 amps adj.						2.5
1.0 to 5.0 amps adj.						5
2.0 to 10 amps adj.						10
4.0 to 20 amps adj.						20

DC Under Current Monitor/Relays

OPERATION

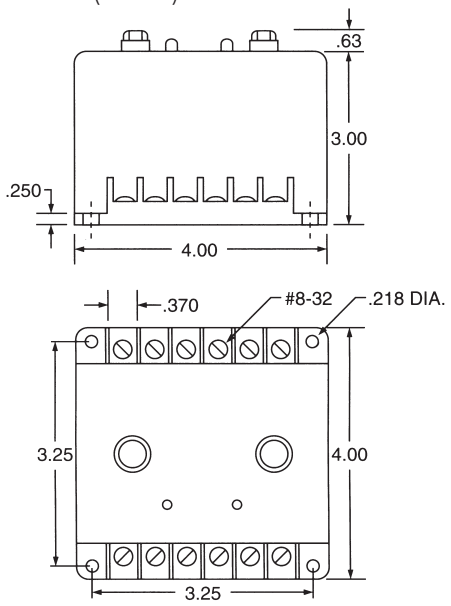
The **CDU Series** is used to detect **UNDER CURRENT** conditions. The internal relay is energized (Pick-up) when the monitored current is above the preset trip point. The relay de-energizes (Drop-out) when the current falls below the trip point for longer than the adjustable delay. The delay is incorporated to prevent nuisance tripping caused by momentary line dips. The relay re-energizes when the current rises 5% above the Drop-out trip point for longer than 0.2 seconds. The relay has the automatic reset feature.



SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
TRIP POINTS	Over Current	
	Pick-up	5% above Drop-out
	Drop-out	See order information
OUTPUT	SPDT, 10 Amps @ 240 VAC Resistive	
HYSTERESIS	5%	
RESPONSE TIME	Operate	0.2 SEC
	Release	0.2 to 10 SEC, Adjustable
INDICATORS	Trip (Green)	Glows When Current is Above Preset Current Trip
	Relay (Green)	Glows when Relay is energized
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Lexan Surface Mounted; #8-32 Screw Terminals	
WEIGHT	17 oz.	

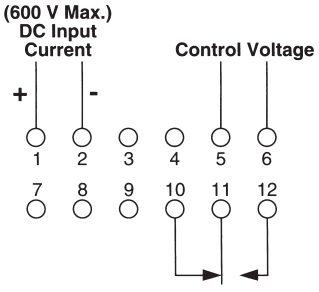
DIMENSIONS (INCHES)



MODEL NUMBER

MODEL NUMBER	CDU	120	A	L	E	
CONTROL VOLTAGE						
120 Volts		120				
TYPE OF VOLTAGE						
AC			A			
ADJUSTMENT						
Lockshaft				L		
FEATURES						
0.2 to 1 amp adj.						1
0.5 to 2.5 amps adj.						2.5
1.0 to 5.0 amps adj.						5
2.0 to 10 amps adj.						10
4.0 to 20 amps adj.						20

WIRING



OPERATION

The **CLB Series** is designed to protect three phase equipment against **CURRENT UNBALANCE** and **OVER CURRENT** conditions.

The control voltage is continuously applied to supply the sensing circuitry and the internal relay. When the current of any phase approximately 20% above the maximum operating current, the inrush delay begins. This delay disables the over current sensors while high inrush currents are present. Any time the currents are outside the preset limits after completion of the inrush delay, the internal relay will de-energize (Drop-out).

A 2% differential (hysteresis) between Pick-up and Drop-out is incorporated to prevent chattering when operated in the automatic reset mode and the current is at the trip point.

The reset mode is selected as follows:

AUTOMATIC: Place a jumper between pins ten (10) and eleven (11).

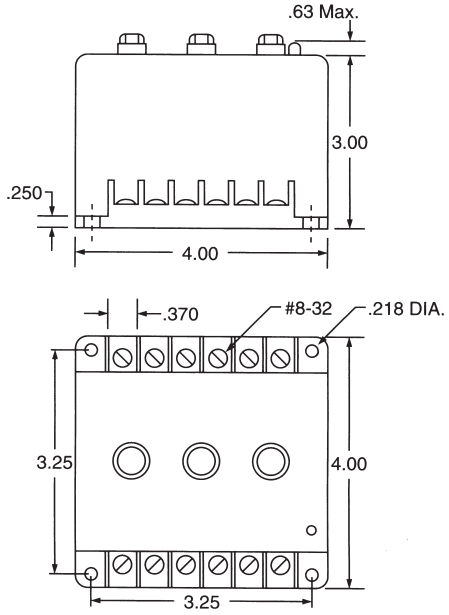
MANUAL: Place a normally open switch between pins ten (10) and eleven (11). When there is a loss and reapplication of the control voltage, the external switch must be closed before the circuit will again become operative.

3-Phase Current Unbalance & Over Current Monitor

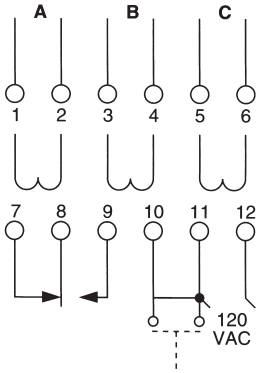
SPECIFICATIONS

OPERATING VOLTAGE	3-Phase, 50/60 Hz, 600 V max	
CONTROL VOLTAGE	120 VAC, 50/60 Hz	
OVER CURRENT	See Table for Adjustable Ranges	
UNBALANCE RANGE	5% to 25%, Adjustable	
INRUSH DELAY	0.1 To 10 SEC, Adjustable; Initiated When Current of Any Phase rises 20% Above the Max. Operating Current	
OUTPUT	SPDT, 10 amp @ 240 VAC Resistive	
HYSTERESIS	2% of Unbalance Setting	
RESPONSE TIME	Operate	1 Second, Max.
	Release	100 mSEC
INDICATOR	LED Glow When All Conditions Are Normal	
RESET	Automatic or Manual	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
WEIGHT	13 oz.	

DIMENSIONS (INCHES)



WIRING



MODEL NUMBER	CONTROL RANGE	OVER CURRENT RANGE
CLB-120-ALE-5	120 VAC	1.0 to 5.0 amps, Adjustable
CLB-120-ALE-10	120 VAC	2.0 to 10 amps, Adjustable

c UL us
E55826

AC Go/No-Go Current Monitor/Relay

- Easy Installation
- No physical connection to the AC line that is being monitored
- Magnetically coupled by passing supply line through protruding Current Transformer
- Heavy Duty Contacts
- 8-Pin, Plug-in

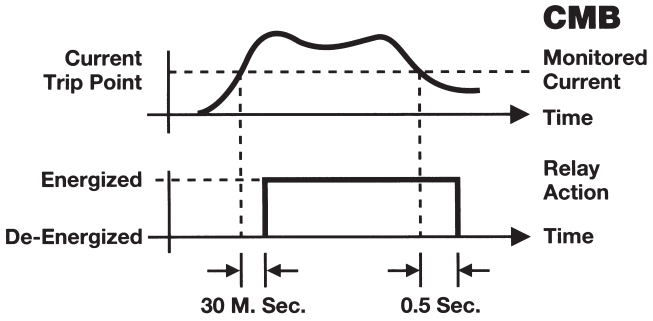
SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC; 50/60 Hz, 24 VDC	
TRIP POINTS	1-10 Amps, Fixed	
AC INPUT CURRENT	Up to 50 Amps	
OUTPUT	SPDT, 10 Amps @ 240 VAC Resistive; 211 VA @ 120 VAC Inductive: 1/6 Horsepower @ 120 VAC or 1/3 Horsepower @ 240 VAC	
POWER CONSUMPTION	3 Watts (Approximately)	
RESPONSE TIME	Operate	30 mSEC
	Release	0.5 SEC
LIFE EXPECTANCY	Mechanical	10 Million Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
DUTY CYCLE	Continuous	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
SOCKETS	RB-08 or PF083A	
ENCLOSURE	Lexan Dust Cover; 8-Pin plug-in	
WEIGHT	6 oz	

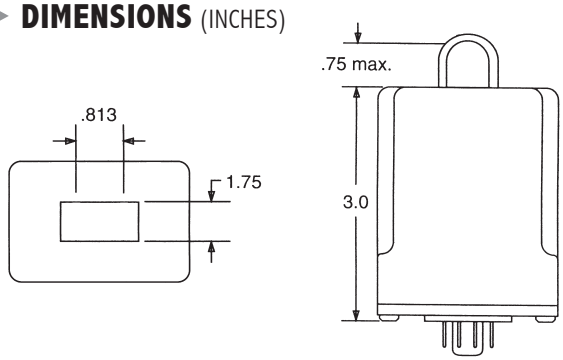
OPERATION

The **CMB Series** relay is used to detect the presence of AC current. When the monitored current exceeds the trip point for longer than 30 milliseconds, the internal relay energizes. When the monitored current drops below the trip point for longer than 0.5 seconds, the internal relay de-energizes. The Delay-on-Release is incorporated to prevent nuisance tripping caused by momentary dips in the load line.

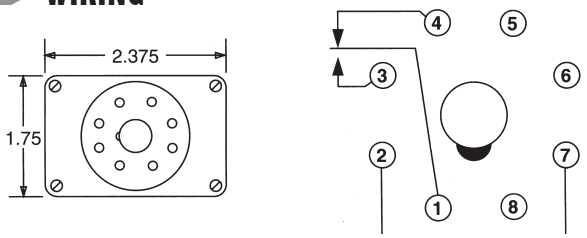
An External CT may be used to extend the range of the Current Monitor.



DIMENSIONS (INCHES)



WIRING

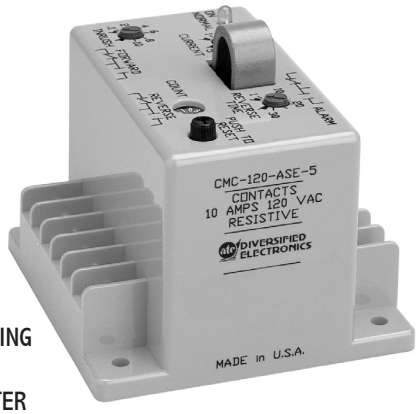


MODEL NUMBER

MODEL NUMBER	CMB			F	A	
CONTROL VOLTAGE						
24 Volts AC		24	A			
24 Volts DC (Not c UL us)		24	D			
120 Volts AC		120	A			

CURRENT TRIP POINTS	
1 amp	1
2 amps	2
3 amps	3
4 amps	4
5 amps	5
6 amps	6
7 amps	7
8 amps	8
9 amps	9
10 amps	10

The **CMC Series** is used to detect a motor jam up and give the equipment an opportunity to clear itself before going into a lockout and alarm mode.



INCLUDES REVERSING RELAY & FAULT CONDITION COUNTER

OPERATION

Control voltage is continuously applied to the CMC monitor. Upon application of the control voltage the Forward and Alarm Relays energize. When AC current is initially applied, the Inrush Time Delay is initiated to disable the over current sensor during the inrush period. (See 1 on graph).

On over current the Forward Relay de-energizes and the unit has a 5 second dead band, then the Reverse Relay energizes for the selected time delay. Then, the Reverse Relay de-energizes, rests for the Dead Band and the Forward Relay energizes completing one full cycle (See 2 on graph). After one cycle is complete the Forward relay remains energized if conditions have returned to normal. If an overcurrent remains, the unit will go through the same operating sequence as before until jam is corrected or the number of preselected cycles have occurred.

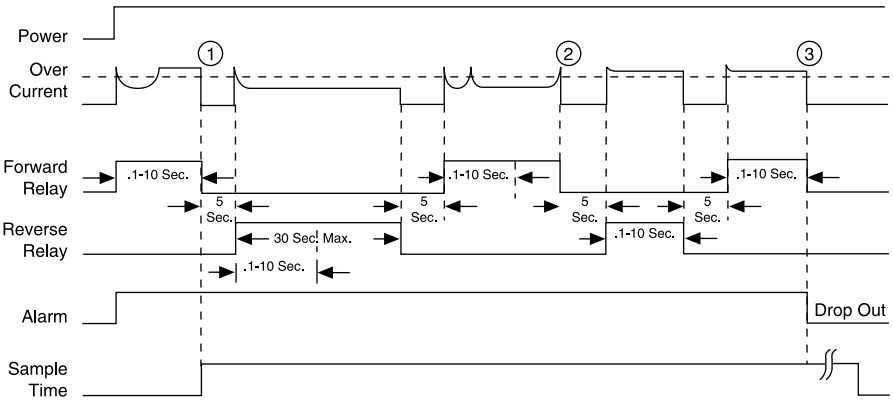
The number of cycles that occur before lockout is field selectable from 1 to 9 cycles. to prevent the faults from accumulating and causing nuisance alarms, a Time Band is initiated upon sensing the first fault. Then, successive occurrences equaling the number of faults within the Time Band will cause alarm. The Formula for the time Band is 70 seconds x (Count-1)

When the number of cycles reaches the pre-selected count, the Forward, Reverse and Alarm Relays lock into the de-energized state. (See 3 on graph) Reset is accomplished by pressing the reset button.

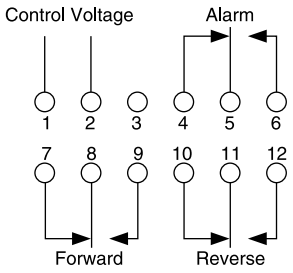
The LED indicator glows when the Forward Relay is energized. The CMC series operates in the fail safe mode as the relays are energized in normal conditions.

An External CT may be used to extend the range of the Current Monitor.

AC Over Current Monitor



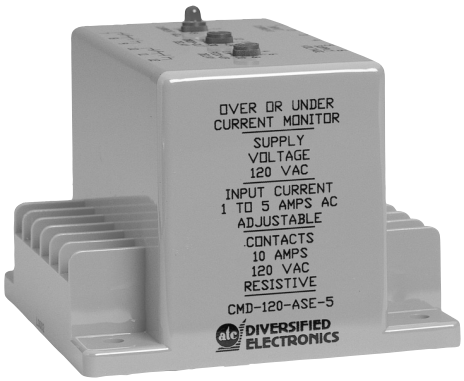
WIRING



SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC, 50/60 Hz	
OVER CURRENT	Inrush Delay	0.1 to 10 SEC, Adjustable (Forward and Reverse Operations)
	Alternating Delay	5 SEC, Fixed
	Reverse Operating Time	0.3 to 30 SEC, Adjustable
	Number of Fault Occurrences	Selector Switch, 1 to 9 occurrences; Must occur within the Sampling Time.
OUTPUT	(3) Separate SPDT 10 Amp Relay Contacts, (1) Forward, (1) Reverse, (1) Alarm	
INDICATOR	LED glows when Forward Relay is energized	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style E: Surface Mount Lexan #8-32 Screw Terminals	
WEIGHT	20 oz.	

MODEL NUMBER	CONTROL RANGE	OVER CURRENT RANGE
CMC-24-ASE-5	24 VAC	1.0 to 5.0 amps
CMC-24-ASE-10	24VAC	2.0 to 10 amps
CMC-120-ASE-5	120 VAC	1.0 to 5.0 amps
CMC-120-ASE-10	120 VAC	2.0 to 10 amps



OPERATION

The **CMD Series** may be used as an **OVER CURRENT** Monitor or an **UNDER CURRENT** Monitor.

The CMD has adjustable Delay-on-Operate and adjustable Delay-on-Release time delays. When the current exceeds the preset current trip point for longer than the Delay-on-Operate time delay, the internal relay will energize (Pick-up). When the current drops below the preset current trip point for longer than the Delay-on-Release time delay, the internal relay will de-energize (Drop-out). When used as an over current monitor the Delay-on-Operate time delay is used to override inrush periods. When used as an under current monitor, the Delay-on-Release timer is used to override a temporary under current condition.

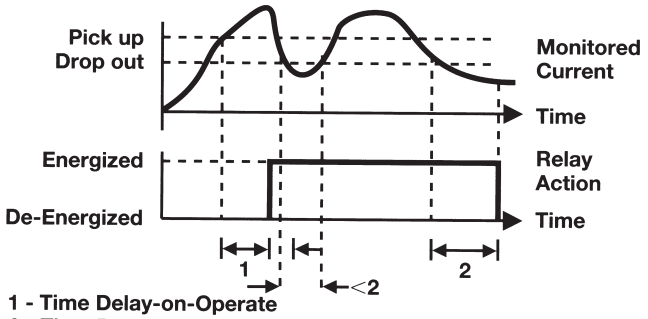
An External CT may be used to extend the range of the Current Monitor.

Universal AC Current Monitor

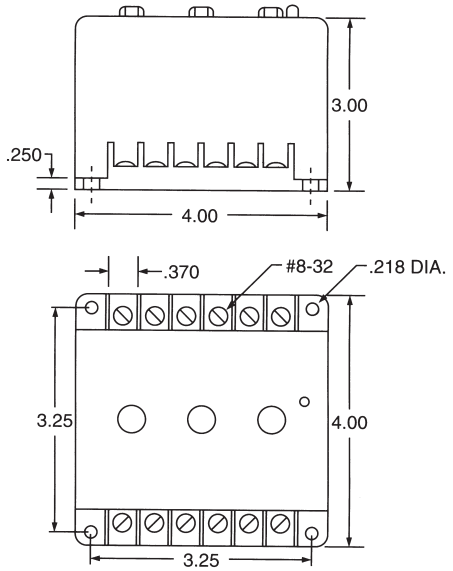
SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC; 50/60 Hz, 24 VDC	
OUTPUT	DPDT, 10 Amp @ 120 VAC Resistive	
RESPONSE TIME	Operate	0.1 to 10 SEC Adjustable
	Release	0.3 to 30 SEC Adjustable
INDICATORS	Glows when relay is energized	
RESET	Automatic	
HYSTERESIS	5%	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
SOCKETS	RB-08 or PF083A	
ENCLOSURE	Lexan Dust Cover; 8-Pin plug-in	
WEIGHT	13 oz	

CMD



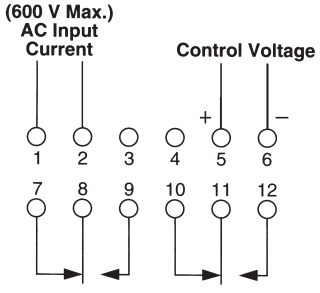
DIMENSIONS (INCHES)



MODEL NUMBER

MODEL NUMBER	CMD			S	E	
CONTROL VOLTAGE						
24 Volts		24				
120 Volts		120				
TYPE OF CONTROL VOLTAGE						
AC			A			
DC			D			
CURRENT TRIP POINTS						
0.05 to 0.25 amp adj. max continuous 3.4 amps						.25
0.2 to 1 amp adj. max continuous 11.9 amps						1
1.0 to 5.0 amps adj. max continuous 13.4 amps						5
2.0 to 10 amps adj. max continuous 25 amps						10
4.0 to 20 amps adj. max continuous 25 amps						20

WIRING



OPERATION

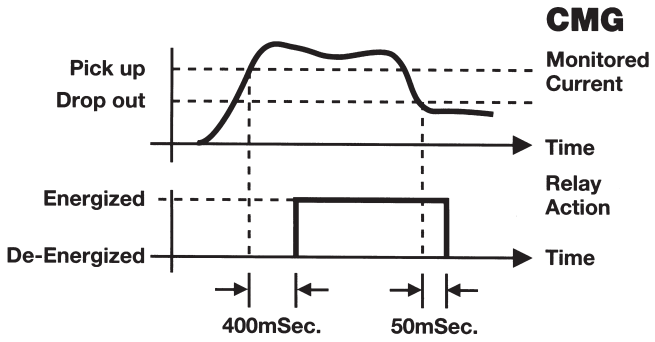
The **CMG Series** is a self powered Current Monitor/Relay that is used to detect the presence of AC current. When the monitored current exceeds the trip point for longer than 400 mSec., the internal relay energizes (Pick-up). When the monitored current drops below the trip point for longer than 50 mSec., the internal relay de-energizes (Drop-out). No physical connection is required as the line to be monitored is magnetically coupled by passing the conductor through the protruding Current Transformer of the monitor. No external supply is needed to power the monitor.

The current trip point specified is with one turn through the transformer. Each time the number of turns through the transformer doubles, the trip point effectively halves. Example: CMG-0100-20 will trip at 20 amps with one turn passing through the transformer. By placing two turns through the transformer, the relay will trip at 10 amps. Likewise, four turns will cause the relay to trip at 5 amps. (See below)

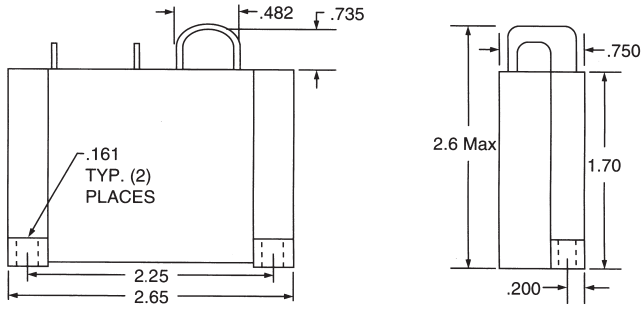
c UL us
E55826

AC Self Powered Go/No-Go Current Monitor/Relays

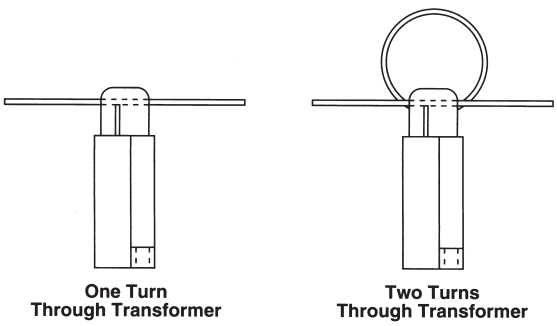
- No physical connection to the AC line that is being monitored
- Magnetically coupled by passing supply line through protruding Current Transformer
- Withstands 400 Ampere-Turns Continuous
- No supply voltage required
- Will operate on 24, 120, 240 or 480 VAC lines
- 1/4" Quick Disconnect Terminals



DIMENSIONS (INCHES)



WIRING

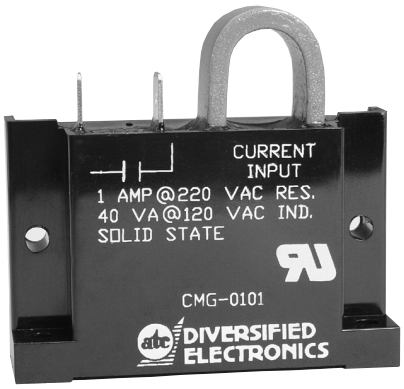


SPECIFICATIONS

CONTROL VOLTAGE	Not Required	
TRIP POINTS	Pick-up	See Order Information
	Drop-out	25% below Pick-up
OUTPUT	SPST - N.O., 5 Amps @ 240 VAC, Res. (Available as a normally closed contact upon request #CMG-0200)	
HYSTERESIS	25%	
RESPONSE TIME	Operate	400mSec. (Approximately)
	Release	50mSec.
ACCURACY	±5% on Pick-up	
TERMINATIONS	(2) 1/4" Quick Disconnect Terminals	
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style "D" Surface Mounted	
WEIGHT	4 oz.	

MODEL NUMBER

MODEL NUMBER	CMG	0100	
CURRENT TRIP POINTS			
20 amps			20
24 amps			24
28 amps			28
32 amps			32
36 amps			36



SOLID-STATE OUTPUT
SELF POWERED

c UL us
E55826

AC Go/No-Go Current Monitor

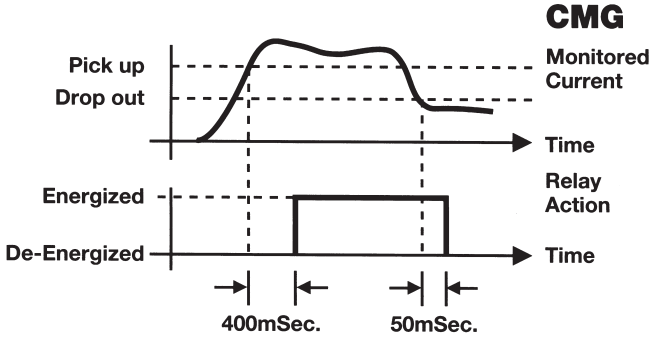
- No physical connection to the AC line that is being monitored
- Magnetically coupled by passing supply line through protruding Current Transformer
- No supply voltage required
- Will operate on 24, 120, 240 or 480 VAC lines
- Easy installation
- 1/4" Quick Disconnect Terminals

SPECIFICATIONS

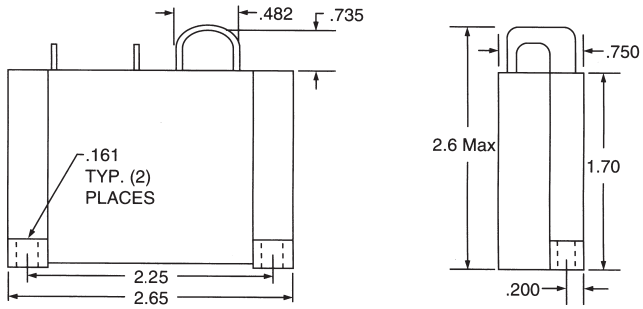
CONTROL VOLTAGE	Not Required	
TRIP POINTS	Pick-up	2 Amps
	Drop-out	25% below Pick-up
OUTPUT	Solid State, SPST-N.O. 1 Amp Resistive; 40 VA Run @ 120 VAC Inductive	
MAXIMUM CONTINUOUS CURRENT	200 Amp turns @ 25°C	
RESPONSE TIME	Operate	2-10 mSEC @ 130 Amps; 400 mSEC @ 10% over
	Release	400 mSEC (Approximately).
ABSOLUTE MAXIMUM OUTPUT VOLTAGE	280 VAC	
ACCURACY	20% on Pick-up	
TERMINATIONS	(2) 1/4" Quick Disconnect Terminals	
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style "D" Surface Mounted	
WEIGHT	4 oz.	

OPERATION

The **CMG-0101 Series** is a solid state self powered Current Monitor that is used to detect the presence of AC current. When the monitored current exceeds the trip point for longer than 400 mSec., the output energizes (Pick-up). When the monitored current drops below the trip point for longer than 400 mSec., the output de-energizes (Drop-out). No physical connection is required as the line to be monitored is magnetically coupled by passing the conductor through the protruding Current Transformer of the monitor. No external supply is needed to power the monitor.



DIMENSIONS (INCHES)



MODEL NUMBER	DESCRIPTION
CMG-0101	AC GO/NO-GO Current Mon

OPERATION

The **CMI Series** AC **OVER CURRENT** Monitor Relay operates in the **FAIL-SAFE MODEL** as the relay is energized (pick-up) when the monitored AC current is normal. The relay de-energizes (Drop-out) when the monitored current rises above the preset trip point or the control voltage is removed. When current is initially applied, a time delay begins. This inhibits the over current sensors while high inrush currents are present. The delay is field adjustable and is set so the delay period is slightly longer than the inrush time of the motor. If the monitored current is above the preset trip point when the delay elapses, the relay de-energizes. (Figure 1) If the current drops to the normal run current of the motor prior to the completion of the delay period, the relay remains energized until the current rises above the trip point, which indicates an abnormal condition. At that time the relay deenergizes and remains locked-out until the reset button is pressed or the control voltage is interrupted, and re-applied. (Figure 2) A typical application is for conveyor jam up detection.

An External CT may be used to extend the range of the Current Monitor.

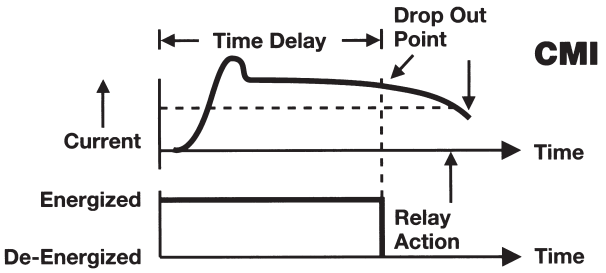


FIGURE 1

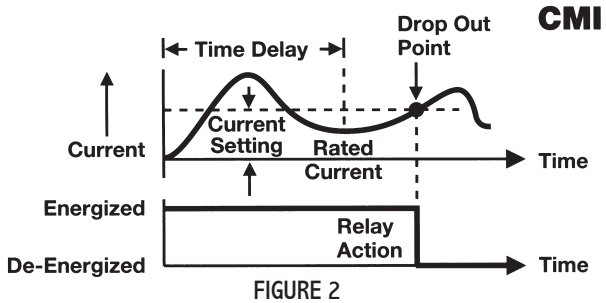


FIGURE 2

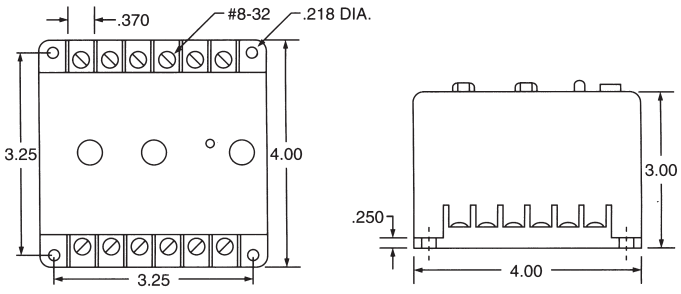
FAIL SAFE DETECTION OF MOTOR JAM UPS

AC Over Current Monitor

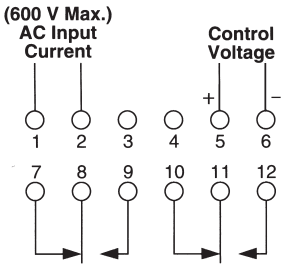
SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC/VDC, 50/60 Hz	
TRIP POINTS	Pick-up	See Order Information
	Drop-out	Press Reset Button or Restore Control Voltage
OUTPUT	DPDT, 10 Amps @ 120 VAC, Resistive	
TIME DELAY	0.2 to 10 SEC, Adjustable On Motor Starting	
OPERATING TIME	50 mSEC (After Initial Delay has Timed Out)	
CURRENT WITHSTAND	20 Times Nominal for 1 Second	
ISOLATION	2500 Volts Between Input and All Other Terminals	
INDICATOR	Glows on Normal Current	
RESET	Manual, Press Button or Interrupt Control Voltage	
RESET TIME	100 mSEC After Lock-Out	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Lexan Surface Mounted; #8-32 Screw Terminals	
WEIGHT	11 oz.	

DIMENSIONS (INCHES)



WIRING



MODEL NUMBER

MODEL NUMBER	CMI		A	S	E	
CONTROL VOLTAGE						
24 Volts		24				
120 Volts		120				
CURRENT TRIP POINTS						
0.05 to 0.25 amp adj.						.25
0.2 to 1 amp adj.						1
1.0 to 5.0 amps adj.						5
2.0 to 10 amps adj.						10
4.0 to 20 amps adj.						20

SUPPLY VOLTAGE 120 VAC
INPUT CURRENT 1.0 TO 5.0 AMPS AC ADJUSTABLE
CONTACTS 10A@120 VAC RESISTIVE 345 VA INDUCTIVE
CML-120-ASA-5
SUPPLY VOLTAGE 120 VAC
CONTACTS 10 AMPS @ 120 VAC RESISTIVE 345 VA @ 120 VAC INDUCTIVE
DIVERSIFIED ELECTRONICS

INCLUDES MANUAL RESET

AC Over Current Monitor

SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC/DC; 50/60 Hz	
TRIP POINTS	Pick-up	See order information
	Drop-out	5% below Pick-up (After Manual Reset)
OUTPUT	DPDT, 10 Amp @ 120 VAC Resistive	
HYSTERESIS	5%	
RESPONSE TIME	Operate	0.1 to 5 SEC, Adjustable
INDICATORS	LED Glows On Over Current (Style "E" Enclosure Only)	
RESET	Manual	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style A	Lexan Dust Cover; 11-pin Plug-in
	Style E	Lexan Surface Mounted: #8-32 Screw Terminals
SOCKET	Style A: RB-11 Style E: 13 oz.	
WEIGHT	6 oz.	

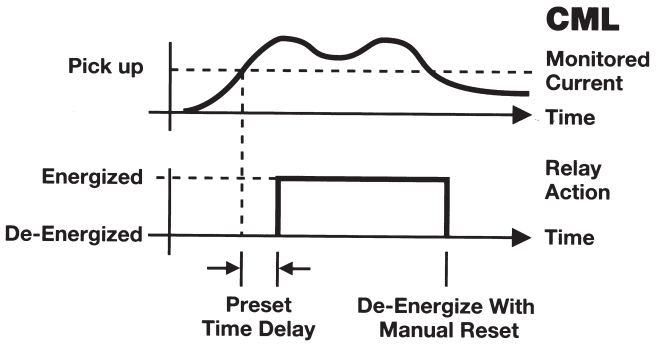
MODEL NUMBER

MODEL NUMBER	CML		A	S		
CONTROL VOLTAGE						
24 Volts		24				
120 Volts		120				
TYPE OF CONTROL VOLTAGE						
AC/DC			A			
ENCLOSURE STYLE						
Plug-In					A	
Surface Mount					E	
CURRENT TRIP POINTS						
0.05 to 0.25 amp adj.						.25
0.2 to 1 amp adj.						1
1.0 to 5.0 amps adj.						5
2.0 to 10 amps adj.						10
4.0 to 20 amps adj.						20

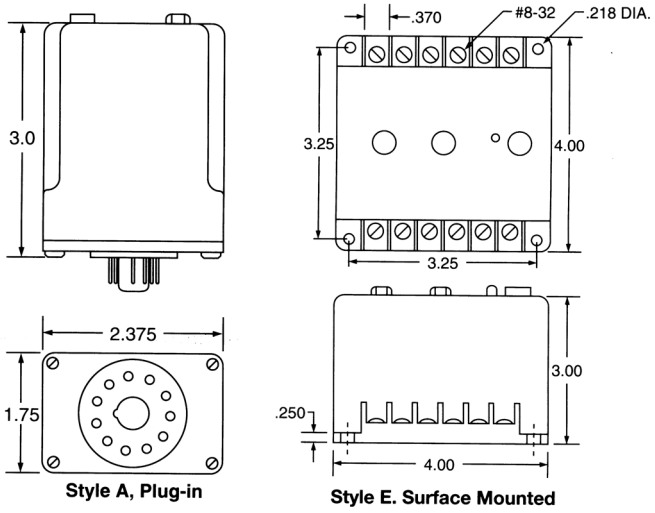
OPERATION

The **CML Series** is used to detect **OVER CURRENT** conditions. The internal relay energizes (Pick-up) when the monitored current exceeds the preset trip point for longer than the adjustable time delay period. The adjustable delay is incorporated to prevent nuisance tripping caused by motor inrush currents. The CML has the **MANUAL RESET** feature. The internal relay de-energizes (Drop-out) when the reset button is pressed. If the current is below the trip point when the button is released, the relay will remain de-energized. If the current is above the trip point, the relay will re-energize.

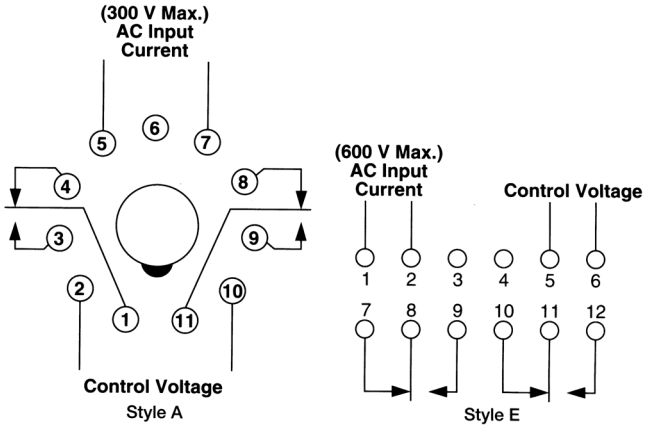
An External CT may be used to extend the range of the Current Monitor.



DIMENSIONS (INCHES)



WIRING

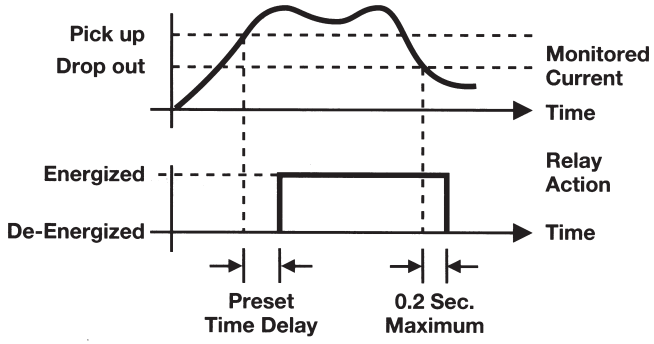


OPERATION

The **CMO Series** is used to detect **OVER CURRENT** conditions. The internal relay energizes (Pick-up) when the monitored current exceeds the preset trip point for longer than the adjustable time delay. The delay is incorporated to prevent nuisance tripping caused by motor inrush currents. The CMO has an automatic reset feature. The internal relay de-energizes (Dropout) when the current drops 5% below the preset trip for longer than 0.2 seconds.

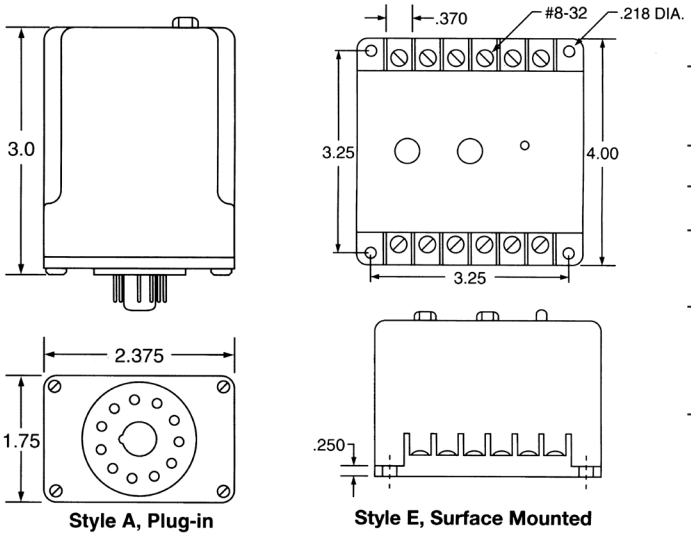
An External CT may be used to extend the range of the Current.

CMO



AC Over Current Monitor/Relays

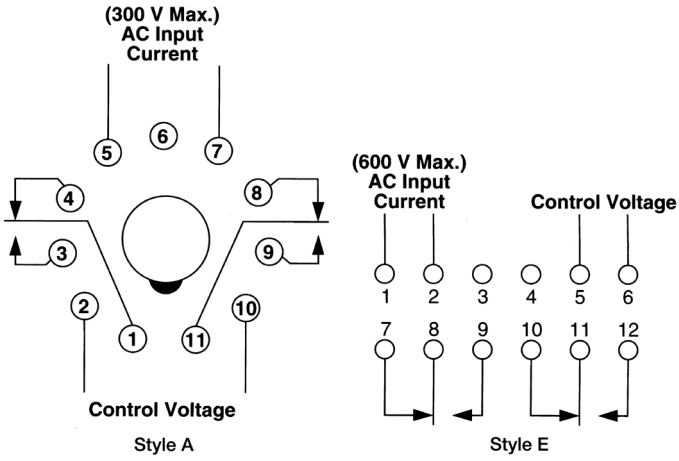
DIMENSIONS (INCHES)



SPECIFICATIONS

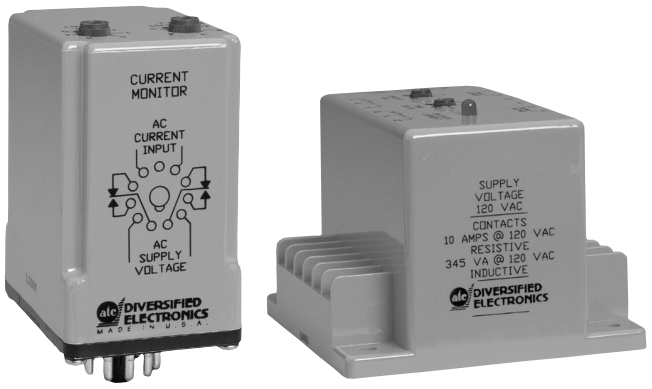
CONTROL VOLTAGE	24 or 120 VAC/DC; 50/60 Hz	
TRIP POINTS	Pick-up	See order information
	Drop-out	5% below Pick-up
OUTPUT	DPDT, 10 Amps @ 120 VAC, Resistive	
HYSTERESIS	5%	
RESPONSE TIME	Operate	0.1 to 5 SEC, Adjustable
	Release	0.2 SEC
INDICATOR	LED Glows On Over Current (Style "E" Enclosure Only)	
SOCKET	RB-11 Socket for Style A.	
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style A	Lexan Dust Cover; 11-pin Plug-in
	Style E	Lexan Surface Mounted: #8-32 Screw Terminals
WEIGHT	Style A: 5 oz. Style E: 13 oz.	

WIRING



MODEL NUMBER

MODEL NUMBER	CMO		A	S		
CONTROL VOLTAGE						
24 Volts		24				
120 Volts		120				
TYPE OF CONTROL VOLTAGE						
AC/DC			A			
ENCLOSURE STYLE						
Plug-In					A	
Surface Mount					E	
CURRENT TRIP POINTS						
0.05 to 0.25 amp adj.						.25
0.2 to 1 amp adj.						1
1.0 to 5.0 amps adj.						5
2.0 to 10 amps adj.						10
4.0 to 20 amps adj.						20



AC Under Current Monitor

SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC/DC; 50/60 Hz	
TRIP POINTS	Pick-up	5% above Drop-out
	Drop-out	See order information
OUTPUT	DPDT, 10 Amp @ 120 VAC Resistive	
HYSTERESIS	5%	
RESPONSE TIME	Operate	0.1 SEC
	Release	0.1 to 5 SEC, Adjustable
INDICATORS	Glows When Current is Above Preset Current Trip Point (Style E Enclosure Only)	
RESET	Automatic	
TEMPERATURE RATING	Operate	32° to 131°F (0° to +55°C)
	Storage	-49° to 185°F (-45° to +85°C)
ENCLOSURE	Style A	Lexan Dust Cover; 11-pin Plug-in
	Style E	Lexan Surface Mounted: #8-32 Screw Terminals
SOCKET	RB-11 Socket for Style A.	
WEIGHT	Style A 5 oz. Style E 10.5 oz.	

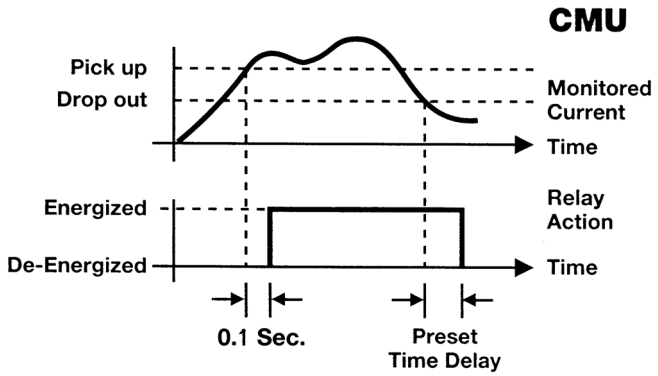
MODEL NUMBER

MODEL NUMBER	CMU			S		
CONTROL VOLTAGE						
24 Volts		24				
120 Volts		120				
TYPE OF CONTROL VOLTAGE						
AC			A			
DC			D			
ENCLOSURE STYLE						
Plug-In					A	
Surface Mount					E	
CURRENT TRIP POINTS						
0.05 to 0.25 amp adj.						.25
0.2 to 1 amp adj.						1
1.0 to 5.0 amps adj.						5
2.0 to 10 amps adj.						10
4.0 to 20 amps adj.						20

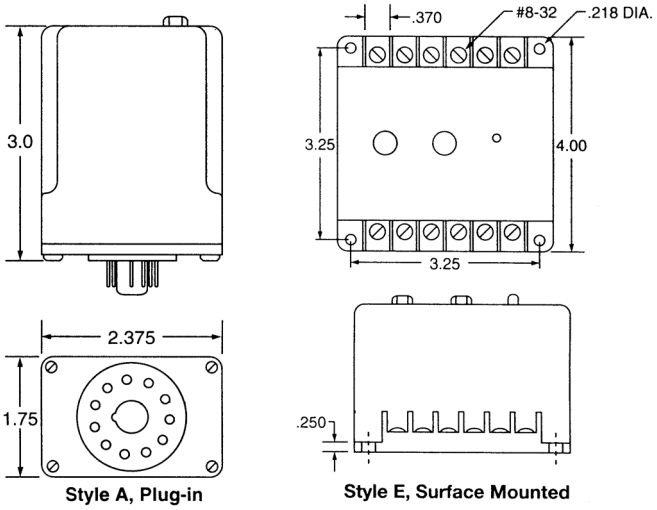
OPERATION

The **CMU Series** is used to detect **UNDER CURRENT** conditions. The internal relay is energized (Pick-up) when the monitored current is above the preset trip point. The relay de-energizes (Drop-out) when the current falls below the trip point for longer than the adjustable delay. The delay is incorporated to prevent nuisance tripping caused by momentary line dips. The relay re-energizes when the current rises 5% above the Drop-out trip point for longer than 0.1 seconds. The relay has the automatic reset feature.

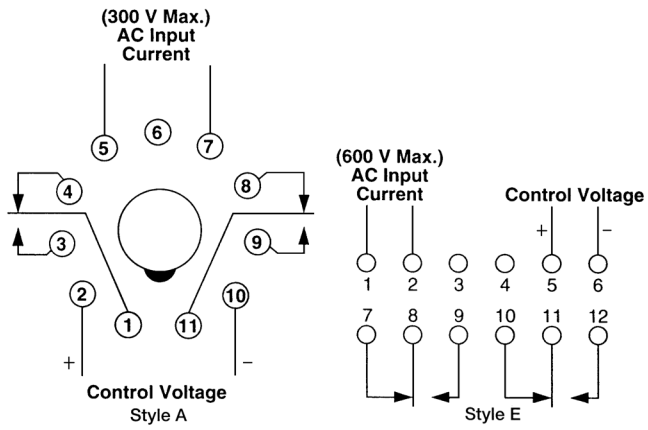
An external CT may be used to extend the range of the Current Monitor.



DIMENSIONS (INCHES)



WIRING



OPERATION

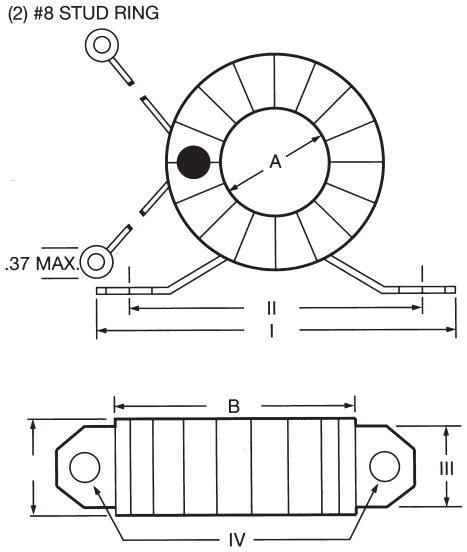
The **CT Current Transformers** are of the inserted primary type with the secondary toroidally wound over a core of oriented electrical steel. The windings are carefully insulated. The entire transformer is then dipped in PVC insulation compound which insures maximum protection against moisture, acids, alkaline, oils and abrasive particles. The securely fastened 24" 14 AWG leads are identified to the extent that the secondary current leaving the CT through the white lead is in phase with the primary current when the primary conductor enters the CT from the side identified by the black dot. To prevent shock and transformer damage, it is important that the secondary leads always form a continuous circuit when the current is flowing in the primary.

An External CT may be used to extend the range of the AC Current Monitors.

Current Transformers

- 600 Volt Insulation
- 25 - 400 Hz Operation
- 25/5 to 2500/5 Amperes
- Optional Mounting Bracket (Add Suffix-B to part number)

DIMENSIONS (INCHES)



GROUP SIZE	A	B	C	I	II	III	IV
1	1-1/4	3-3/4	2-3/4	5-1/4	4	2-1/8	0.281 x 0.5
2	1-1/4	3-7/8	1-1/4	4-1/2	3-7/8	7/8	0.250 x 0.375
3	1-1/4	3-1/2	1-1/4	4-1/2	3-7/8	7/8	0.250 x 0.375
4	1-7/8	4	1-1/4	4-1/2	3-7/8	7/8	0.250 x 0.375
5	3-3/8	6-1/2	1-11/16	7-7/8	6-1/2	1-1/8	0.281 x .5

SPECIFICATIONS

MODEL	RATIO	CAPACITY	ACCURACY	GROUP	WEIGHT
CT-25/5	25/5	2 V.A.	6.00%	1	3 lb. 5 oz.
CT-50/5	50/5	2 V.A.	6.00%	2	1lb. 6 oz.
CT-100/5	100/5	2 V.A.	3.00%	3	1lb. 4.5 oz.
CT-200/5	200/5	2 V.A.	1.50%	3	15 oz.
CT-500/5	500/5	2 V.A.	.60%	3	1 lb. 1 oz.
CT-1000/5	1000/5	2 V.A.	.30%	4	3 lb.
CT-2500/5	2500/5	5 V.A.	.10%	5	3 lb. 4 oz.

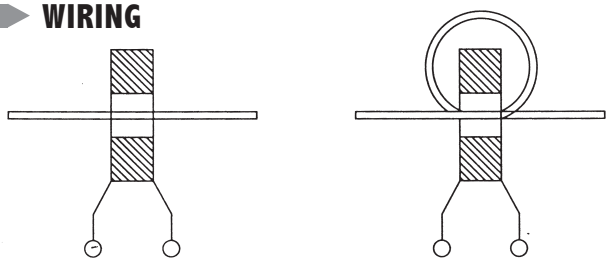
NOTES:

1. The current ratio in the table is the ratio of current in the primary/secondary with one turn on the primary. The ratio can be increased by adding turns on the primary.

2. The transformers may be installed at some distance from the load. However, the interconnecting conductor resistance must not cause the VA rating of the transformer to be exceeded.

3. CTs should not be operated at twice the rated currents. For example, CT-25/5 should not operate above 50/10 amps. With current too high overheating will occur.

WIRING



THREE PHASE CURRENT UNBALANCE

Balanced or matched currents on a three phase system are difficult to maintain because of the many varying factors involved such as, unequal single phase loading, poor connections and cabling and/or dirty or burnt starter contacts.

Although these varying factors can be controlled to maintain as close as possible a balanced line, the unseen conditions such as overheated motor windings, burnt bearings, low voltage, high voltage and single phasing need to be constantly monitored to protect your valuable equipment.

The **CLB Series** Three Phase Current Unbalance and Over Current Monitor (page 167) offers this protection.

To determine the condition of your three phase line and to properly select the **CLB Series** percent unbalance setting a simple calculation formula is needed as follows:

$$\frac{(I\ max - I\ avg)}{I\ max} \times 100$$

Example:

1. Measure the current on each leg.

   Assume A = 10 amps
   B = 12 amps
   C = 9 amps

2. Find Average 10 + 12 + 9 = 31

   $\frac{31}{3} = 10.33$

   I max = 12
   I avg = 10.33

3. Apply formula 12 - 10.33 = 1.67

   $\frac{1.67}{12} = .139 \times 100 = 13.9\%$ unbalance

EXTERNAL CURRENT TRANSFORMERS

The load or burden that can be connected to the secondary of the Current Transformer is usually specified in VA. The rated accuracy of the Current Transformer is guaranteed only when the sum of the VA ratings of all devices (ampmeters, wattmeters, current monitors, etc.) connected to the secondary windings does not exceed the specified VA rating.

The interconnecting conductor resistance must also be considered, especially when the Transformer is installed at some distance from the Current Monitor or other load.

For the wiring, the VA can be calculated using Ohm's Law:

$$VA = E \times I = (I \times R) \times I = I^2R$$

Where I = 5 Amps and R is the DC resistance of the wire.

All of the standard DE Current Transformers have a rating of 2 VA except the 2500/5 version which has a 5 VA rating.

From the above formula we can also calculate the maximum resistance that can be connected to the secondary of a Current Transformer:

$VA=I^2R$, Hence $R = \frac{VA}{I^2}$

Example:

$VA = 2 \quad R_{max} = \frac{VA}{I^2} = \frac{2}{(5)^2} = 0.08$ Ohms = 80 milliohms

$VA = 5 \quad R_{max} = \frac{VA}{I^2} = \frac{5}{(5)^2} = 0.2$ Ohms = 200 milliohms

If the only load on the Current Transformer is a DE Current Monitor, its VA rating (approx. 0.15 VA) is small compared to the Current Transformer rating and can be neglected. This means that the resistance of the wiring can be 80 milliohms max. for the 2 VA units and 200 milliohms max for the 5 V A unit.

Gauge	Ohms per 1000'	Milliohms per foot
AWG 14	2.5	2.5
AWG 16	4.0	4.0
AWG 18	6.4	6.4
AWG 20	10.0	10.0

Example:

For a 2 VA Current Transformer, the length of AWG 16 wire would be:

$$\frac{80\ milliohms}{4.0\ milliohms/ft} = 20'$$

Because we are dealing with a pair of wires, the maximum distance from the Current Transformer to the Current Monitor can be only 10 ft.

As we can see, it is important to keep the wire length to minimum, use heavy wire, and keep all connections clean and tight.

ALTERNATING RELAYS

ATC-Diversified Electronics offers a wide variety of models for various staging requirements. The different models available are: **Duplexors, Triplexors, Quadraplexors, Special Function**, and **Expandable Alternating Relays**.

The **Alternating Relay** is used in multiple load installations to assure equal run time on all loads. They also allow for the addition of more capacity in the event of excess load requirements. The Alternating Relay provides equal run time on two or more loads by alternating the sequence in which the loads are allowed to start up. In each case, the alternating action is initiated each time the control switch across designated terminal opens. The control switch may be a float, a thermostat, a pressure switch, or a timer contact.

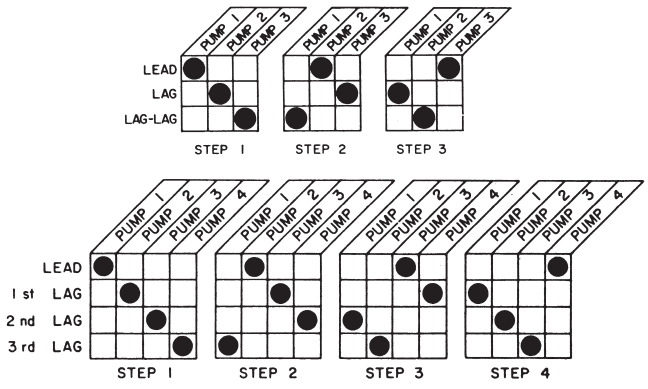
ALTERNATING CONTROLLERS

The **ARM Series**, **Alternating Controllers**, are used in multiple load installations to assure equal run time on all loads. They also allow for the addition of more capacity in the event of excess load requirements. The Alternating Controllers provide equal run time on two or more loads by alternating the sequence in which the loads are allowed to start up.

All **ARM** models feature **intrinsically safe inputs** and logic that allows the outputs to operate even if one of the inputs fails to open or close. For example: if the off switch fails to close, the lead load will not energize until both the lead and the lag switches close. An inrush delay on all models reduces line sags by preventing multiple loads from energizing simultaneously.

FEATURE MATRIX

Model Number	NUMBER OF LOADS SEQUENCED 2	3	4	ENCLOSURE STYLE A	E	EXPANDABLE	EXTERNAL CLOCKING	AUTOMATIC ALTERNATING	FIELD SELECTABLE SEQUENCING	UL/CANADIAN UL RECOGNIZED	UL LISTED	CSA CERTIFIED
ARA-XXX-ABA	●			●				●		●		●
ARA-XXX-ACA	●			●				●		●		●
ARA-XXX-ADA	●			●				●		●		●
ARA-XXX-AEA	●			●				●		●		●
ARA-XXX-AFE		●			●		●	●			●	●
ARA-XXX-AGE			●		●		●	●			●	●
ARA-120-AHE		●			●		●	●				
ARA-120-AJE		●			●		●	●	●			
ARA-120-AME	●	●			●	●	●	●				
ARA-120-ANE		●	●		●	●	●	●				
ARB-XXX-ABA	●			●				●	●	●		●
ARB-XXX-ACA	●			●				●	●	●		●
ARB-XXX-ADA	●			●				●	●	●		●
ARB-XXX-AEA	●			●				●	●	●		●



FEATURE MATRIX

Model Number	NUMBER OF LOADS SEQUENCED 2	3	4	STYLE SURFACE MOUNT	PANEL MOUNT	AUTOMATIC ALTERNATING	SELECTABLE SEQUENCING	OUTPUT LOGIC (SOSO)	OUTPUT LOGIC (FOSO)	OMIT	LEAD SELECT	UL LISTED 913
ARM-XXX-AAE		●		●		●		●				●
ARM-XXX-AAEP		●		●	●	●		●				●
ARM-XXX-ABE		●		●		●			●			●
ARM-XXX-ABEP		●		●	●	●			●			●
ARM-XXX-ACE		●		●		●	●	●		●	●	●
ARM-XXX-ACEP		●		●	●	●	●	●		●	●	●
ARM-XXX-ADE		●		●		●	●		●	●	●	●
ARM-XXX-ADEP		●		●	●	●	●		●	●	●	●
ARM-XXX-AFE	●			●		●	●	●	●		●	●
ARM-XXX-AFEP	●			●	●	●	●	●	●		●	●
ARM-XXX-AGE			●	●		●		●				●
ARM-XXX-AGEP			●	●	●	●		●				●
ARM-XXX-AHE			●	●		●			●			●
ARM-XXX-AHEP			●	●	●	●			●			●

E55826

Duplexor

The **Duplexor** is used in control panels where **two loads** are required to alternate to provide equal run time on the loads. The alternating action is initiated by a control switch, which is common with one side of the control voltage. The output contacts will change states each time the control switch is opened, thus alternating the two loads. The LED indicators show the position of the output relay.

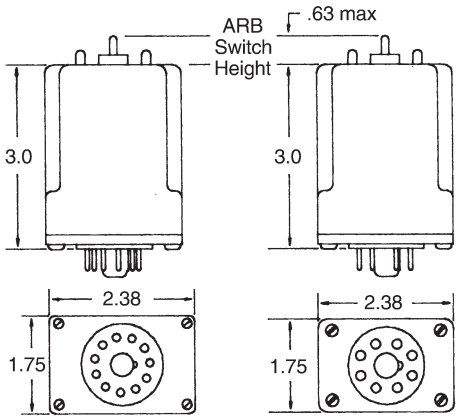
The **ARA Series** is the standard **Duplexor** providing automatic alternating sequence. The **ARB** has the automatic sequencing feature plus the option of locking it into one sequence. A three position switch permits the field selection of normal duplexing action, locking in the A-B sequence, or B-A sequence.

SPECIFICATIONS

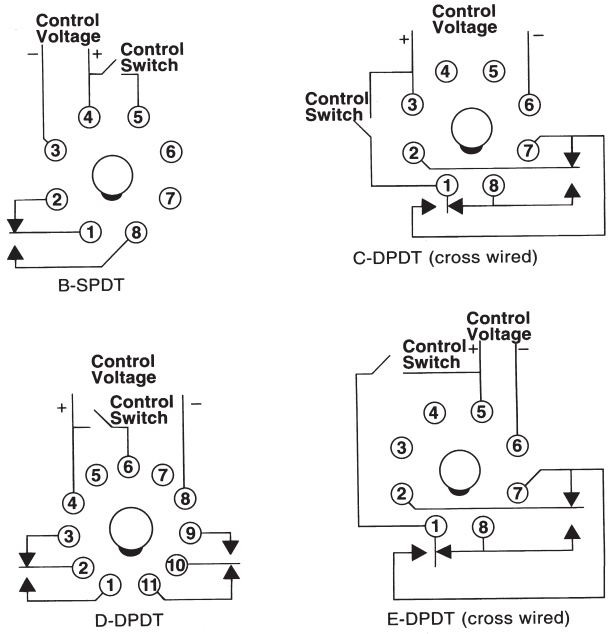
CONTROL VOLTAGE	24, 120 VAC/DC, 208, 240, 480 VAC, 50/60Hz, 48 VDC, ±10%	
CONTROL SWITCH CURRENT	1 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED Shows Output Position	
TEMPERATURES RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
CONTACT RATING	10 Amps @ 240 VAC, Resistive 1/8 hp @ 120 VAC 1/4 hp @ 240 VAC Inductive 360 VA @ 240 VAC, Inductive	
ENCLOSURE	"A" Lexan® Dust Cover	
TERMINATIONS	Industrial Plug-in	
WEIGHT	4.5 oz.	

NOTE: For Analog signal inputs, ATC offers a duplexing pump control — the ATC-Digitec 3800 Panel Meter, 480 VAC is not available in the D-DPDT 11-Pin configuration

DIMENSIONS (INCHES)



WIRING



MODEL NUMBER

MODEL NUMBER	AR					A
TYPE OF ALTERNATING RELAY						
Standard Duplexor		A				
Special Function Duplexor		B				
CONTROL VOLTAGE						
24 VAC/DC			24			
48 VDC			48			
120 VAC/DC			120			
208 VAC			208			
240 VAC			240			
380-408 VAC (Consult Factory)			480			
TYPE OF VOLTAGE						
VAC or VAC/DC				A		
48 VDC only				D		
CONTACT CONFIGURATION						
SPDT					B	
DPDT (Cross Wired)					C	
DPDT					D	
DPDT (Cross Wired)					E	
ENCLOSURE STYLE						A

The **Triplexor and Quadraplexor Alternating Relays** are designed for use in **MULTIPLE LOAD** installations that are required to alternate in sequence while assuring equal run time on all loads. They also allow for additional loads to run in the event of excess load requirements.

The **Triplexor and Quadraplexor** have the option of automatic alterations or external clocking alterations. When the factory installed jumper is in place the alternating action is initiated by a control switch, which is common with one side of the control voltage. When the jumper is removed the alternating action is initiated by an isolated normally open switch.

ARA-XXX-AFE ALTERNATING ACTION

TRIPLEXOR: For automatic alterations a factory-installed jumper is in place between terminals 3 and 4. The alternating action is accomplished when the control switch between terminals 2 and 4 opens.

For external clocking alterations, remove the factory-installed jumper between terminals 3 and 4 and place an isolated normally open switch between terminals 2 and 3. The alternating action will occur each time this isolated switch is closed and then re-opened.

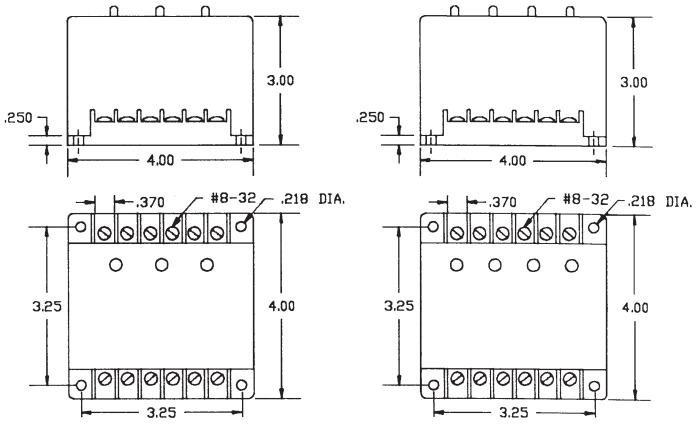
ARA-XXX-AGE

QUADRAPLEXOR: For automatic alterations, a factory installed jumper is in place between terminals 11 and 12. The alternating action is accomplished when the control switch between terminals 2 and 3 opens.

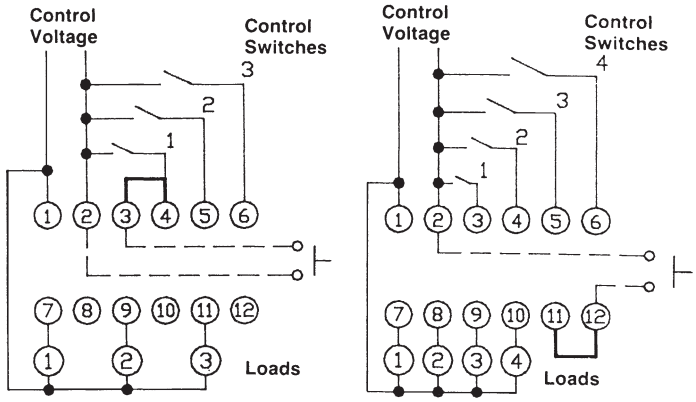
For external clocking alterations, remove the factory-installed jumper between terminals 11 and 12 and place an isolated normally open switch between terminals 2 and 12. The alternating action will occur each time this isolated switch is closed and then re-opened.

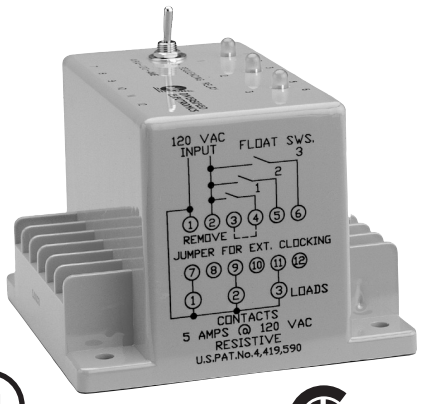
In the event of a power failure the Alternating Relays will return to their quiescent state and continue sequencing loads on one-at-a-time.

DIMENSIONS (INCHES)



WIRING





C UL US
LISTED
IND. CONT. EQ.
496Y

Triplexor

SPECIFICATIONS

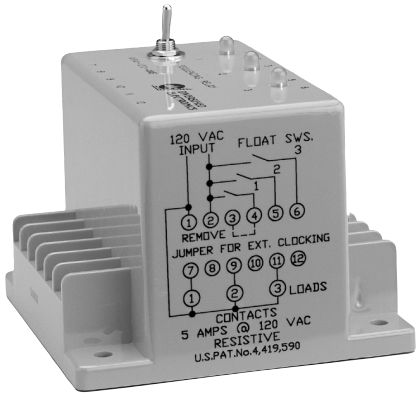
CONTROL VOLTAGE	24, 120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
	Quadraplexor	(4) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED's Show Condition of Outputs	
TEMPERATURES RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	12 to 14 oz.	

NOTE: For Analog signal inputs, ATC offers a duplexing pump control the ATC-Digitec 3800 Panel Meter.

MODEL NUMBER

MODEL NUMBER	ARA		A		E
CONTROL VOLTAGE					
24 V Triplexor		24			
120 V Triplexor		120			
120 V Quadraplexor		120			
Triplexor				F	
Quadraplexor (120 V only)				G	

The ARA Series Triplexor and Quadraplexor are UL Listed under UL File Number E55826.

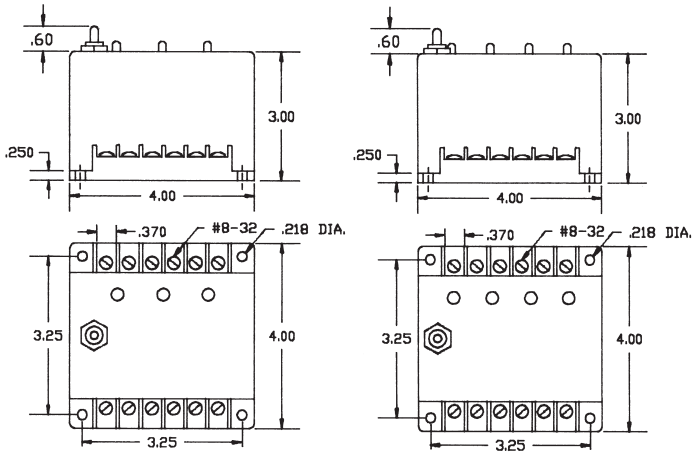


Expandable Alternating Relays

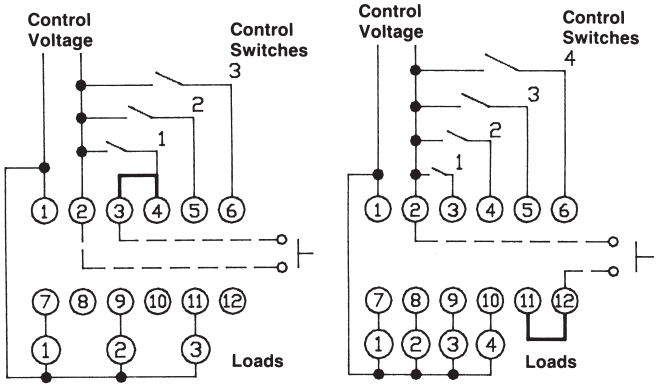
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ARA-120-AME	Duplexor/Triplexor
ARA-120-ANE	Triplexor/Quadraplexor

DIMENSIONS (INCHES)



WIRING



The **Expandable Alternating Relays** are designed for use in multiple load installations that are required to alternate in sequence and have the ability to accept an additional load installation in the future.

ARA-120-AME: The ARA-120-AME is a **Duplexor/Triplexor Alternating Relay**. With the selector switch in position A, this alternating relay will duplex the loads on terminals 7 and 9. With the switch in position B, the Alternating Relay will triplex the three loads on terminals 7, 9 and 11.

For automatic alterations, a factory-installed jumper is in place between terminals 3 and 4. The alternating action is accomplished when the control switch between terminals 2 and 4 opens.

For external clocking alterations, remove the factory installed jumper between terminals 3 and 4 and place an isolated normally open switch between terminals 2 and 3. The alternating action will occur each time this isolated switch is closed and then re-opened.

ARA-120-ANE: The ARA-120-ANE is a **Triplexor/Quadraplexor Alternating Relay**. With the selector switch in position A, the Alternating Relay will triplex between the loads on terminals 7, 8 and 9. With the switch in position B, the Alternating relay will quadraplex the loads on terminals 7, 8, 9 and 10.

For automatic alterations, a factory installed jumper is in place between terminals 11 and 12. The alternating action is accomplished when the control switch between terminals 2 and 3 opens. For external clocking alterations, remove the factory installed jumper between terminals 11 and 12 and place an isolated normally open switch between terminals 2 and 12. The alternating action will occur each time this isolated switch is closed and then re-opened.

In the event of a power failure the Alternating Relays will return to their quiescent state and continue sequencing loads on one-at-a-time.

SPECIFICATIONS

CONTROL VOLTAGE	120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
	Quadraplexor	(4) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED's Show Condition of Outputs	
TEMPERATURES RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	12.5 to 14 oz.	

OPERATION

The **ARA-120-AHE** is a special function **TRIPLEXOR** designed for three load installations. This model has a field selection switch that is used to omit one of the three loads for general or emergency maintenance while duplexing the remaining two loads. The ARA-120-AHE has the option of alternating on each load cycle or by external clocking. This alternating relay also allows for additional loads to run in the event of excess load requirements.

The alternating action is initiated by the control switch between terminals 2 and 4 when the factory installed jumper is in place between terminals 3 and 4.

The alternating action may be initiated externally by removing the factory installed jumper between terminals 3 and 4 and placing an isolated normally open switch between terminals 2 and 3. An alternating action will occur each time this isolated switch is closed and then re-opened.

The selection switch has the following positions:

Normal — Normal operation as Triplexor

Omit 1 — Omit load #1 Duplex loads 2 and 3

Omit 2 — Omit load #2 Duplex loads 1 and 3

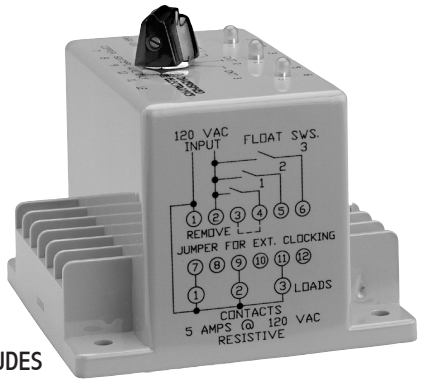
Omit 3 — Omit load #3 Duplex loads 1 and 2

In the event of a power failure, the Alternating Relay will return to its quiescent state and continue sequencing loads on one-at-a-time.

NOTE: When the "omit load" option is selected, full potential will appear on the output terminal of the omitted load when the lag switch between terminals 2 and 5 closes. It is recommended that the H-O-A switch be placed in the "off" position for the omitted load.

SPECIFICATIONS

CONTROL VOLTAGE	120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED's Show Condition of Outputs	
TEMPERATURES RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	16 oz.	



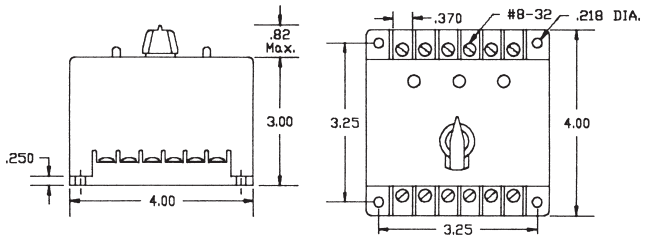
INCLUDES "LOAD OMIT" SWITCH

Special Function Alternating Relay

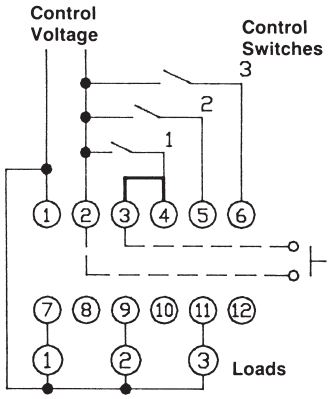
ORDERING INFORMATION

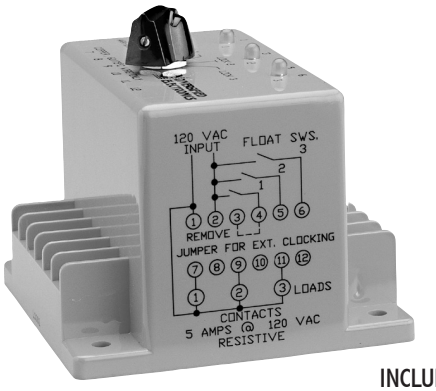
MODEL NUMBER	DESCRIPTION
ARA-120-AHE	Special Function Alternating Relay

DIMENSIONS (INCHES)



WIRING





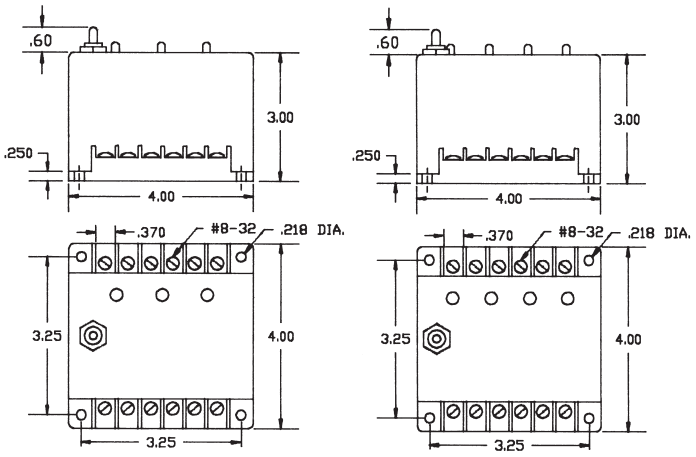
INCLUDES SEQUENCE LOCKING SWITCH

Triplexor Alternating Relay

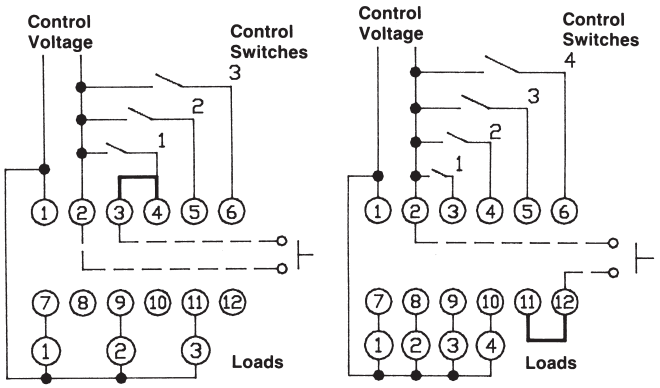
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ARA-120-AJE	Alternating Relay

DIMENSIONS (INCHES)



WIRING



OPERATION

The **ARA-120-AJE** is a special function **TRIPLEXOR** designed for three load installations. This model has a field selection switch that is used to lock the Alternating Relay into a desired sequence. The ARA-120-AJE has the option of automatically alternating on each load cycle or by external clocking. This Alternating Relay also allows for additional loads to run in the event of excess load requirements.

The alternating action is initiated by the control switch between terminals 2 and 4 when the factory installed jumper is in place between terminals 3 and 4. The alternating action may be initiated externally by removing the factory installed jumper between terminals 3 and 4 and placing an isolated normally open switch between terminals 2 and 3. The alternating action will occur each time this isolated switch is closed and then re-opened.

A four position **ROTARY SWITCH** has been incorporated to permit field selection of the sequence that is to be maintained. The selection switch has the following positions:

Normal — Normal operation as a Triplexor

Lock 1 — Locks in sequence 1-2-3; No alternation will occur while in this position.

Lock 2 — Locks in sequence 2-3-1; No alternation will occur while in this position.

Lock 3 — Locks in sequence 3-1-2; No alternation will occur while in this position.

In the event of a power failure, the alternating relay will return to its quiescent state and continue sequencing loads on one-at-a-time.

SPECIFICATIONS

CONTROL VOLTAGE	120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH CURRENT	2 mA	
POWER REQUIRED	3 VA (Approximately)	
DUTY CYCLE	Continuous	
OUTPUT RATING	Triplexor	(3) 5 Amp Resistive, 1/6 hp, 211 VA @ 120 VAC, Inductive Externally Switched to terminal #2
LIFE EXPECTANCY	Mechanical	10,000,000 Operations (Minimum)
	Electrical	100,000 Operations @ Rated Load
INDICATORS	LED's Show Condition of Outputs	
TEMPERATURES RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	17 oz.	

The **ARM Series** Alternating Relay is a **microprocessor-based controller** designed for use in dual load installations to assure equal run time on each load. LED indicators show the status of the unit's five intrinsically safe control switch inputs, one alarm, and two load outputs. H-O-A switches, a lead select switch, and a test/clear button are provided for manual control. The ARM Series reduces the number of components required for this application by combining many functions into one unit.

TWO PUMP SEQUENCING: Evenly distributes run time by automatically alternating lead and lag load designations when the off control switch input opens.

UL913 INTRINSICALLY SAFE: Control switch inputs are low voltage/low current and are electronically isolated from the control voltage and load alarm contacts.

H-O-A Switches: Hand-Off-Automatic switches allow for manual operation.

LEAD SELECT SWITCH: Disables the automatic sequencing function and allows loads to be locked into the 2-1 or 1-2 sequence.

CONTROL SWITCH FAULT DETECTION: Unit detects open and shorted control switch failures.

TEST/CLEAR SWITCH: Verifies function and resets the control switch fault detection algorithm.

ALARM OUTPUT: Alarm contacts close when a control switch fails or the system's capacity is exceeded.

INRUSH CURRENT DELAY: Reduces line sags by preventing both loads from energizing simultaneously.

VERSATILE MOUNTING: Two (2) mounting configurations are available. The standard surface mount has top access to controls and indicators and is intended for back panel mounting. The panel mount option is intended for front panel or door cutout access to controls and indicators.

SPECIAL CONTROLS: ARM-2003 and **ARM-2010**–Standard operation without the H-O-A switches **ARM-2011**–Standard operation without the Control Switch Failure feature.

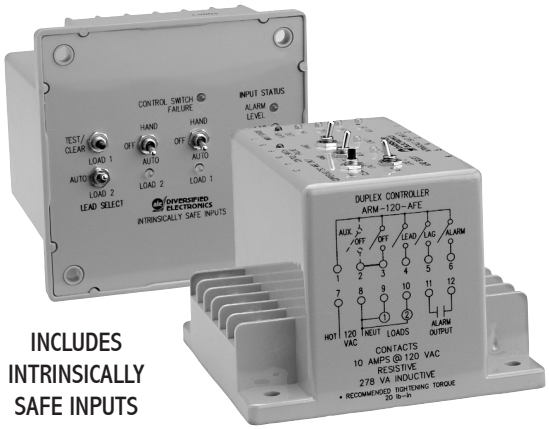
ORDERING INFORMATION

MODEL NUMBER	CONTROL VOLTAGE	MOUNTING	COMMENTS
ARM-XXX-AFE*	24 or 120 VAC	Surface	Standard
ARM-XXX-AFEP*	24 or 120 VAC	Panel	Standard
ARM-2003	120 VAC	Surface	Special: w/o H-O-A switches
ARM-2010	120 VAC	Panel	Special: w/o H-O-A switches
ARM-2011	120 VAC	Surface	Special: w/o Control switch failure feature

*Replace XXX with desire control voltage (24, 120)

The ARM Series is UL Listed under UL File Number E151578.

Process Control Equipment for Hazardous Locations 7M26 UL913



INCLUDES INTRINSICALLY SAFE INPUTS

Integrated Duplex Controller

SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC ±10%, 50/60 Hz			
CONTROL SWITCH	Open Circuit Voltage	5 VDC		
	Short Circuit Voltage	0.1mA		
POWER REQUIRED	4 VA Maximum			
DUTY CYCLE	Continuous			
RESPONSE	Power Up	3 SEC. ±5%		
	Inrush Current	5 SEC. ±5%		
CONTACT RATING	(3) SPST-N.O. 10 Amp Resistive, 1/4 hp, 278 VA Inductive @ 120 VAC			
LED INDICATORS	Designation	Color	State	Condition
	Level/Alarm	Red	ON	CS5 Closed
	Lag	Green	ON	CS4 Closed
	Lead	Green	ON	CS3 Closed
	Off	Green	ON	CS2 Closed
	Aux. Off	Green	ON	CS1 Aux./cs2 Closed
	Load 1	Green	ON	Load ON
	Load 2	Green	ON	Load ON
	Ctrl. Switch	Red	ON	Failure Open/Closed
LIFE EXPECTANCY	Mechanical	20 Million Operations		
	Electrical	75,000 @ Rated Load		
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)		
	Storage	-40° to 185°F (-40° to +85°C)		
TERMINATIONS	(12) #8-32 Screw Terminals			
WEIGHT	16 oz.			

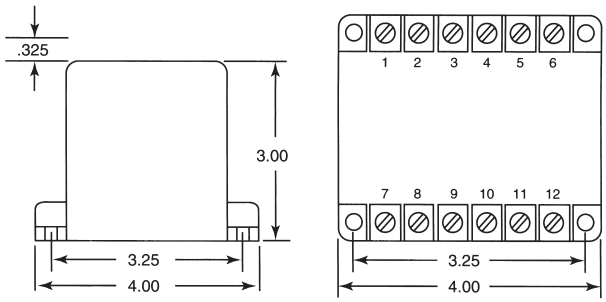
OPERATION

FOUR CONTROL SWITCHING: Do not remove factory-installed jumper between terminals 2 and 3. The control switches connected to terminals 3 through 6 are labeled OFF (CS2), LEAD (CS3), LAG (CS4) and ALARM (CS5). Under normal operation the lead load energizes when the off and lead control switches close in order. The lag load energizes when the lag closes and the alarm load energizes when the alarm switch closes. When all four switches reopen in the proper order all outputs are de-energized and the lead/lag output designations reverse.

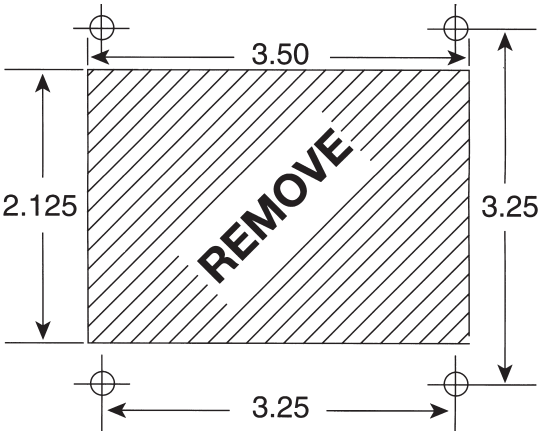
FIVE CONTROL SWITCHING: Remove factory installed jumper between terminals 2 and 3. After the jumper has been removed, the additional control switch is connected to terminal 2. The extra switch functions as an AUXILIARY OFF (CS1) switch. It is used to prevent loads from running continuously if the primary OFF (CS2) switch fails to open properly.

FAULT DETECTION ALGORITHM: If any of the control switches open or close out of order, the alarm output energizes and a fault detection algorithm is used to identify the faulty switch. The faulty switch is then ignored and the OFF, LEAD, and LAG control switch designations are altered to maintain safe operation.

DIMENSIONS (INCHES)



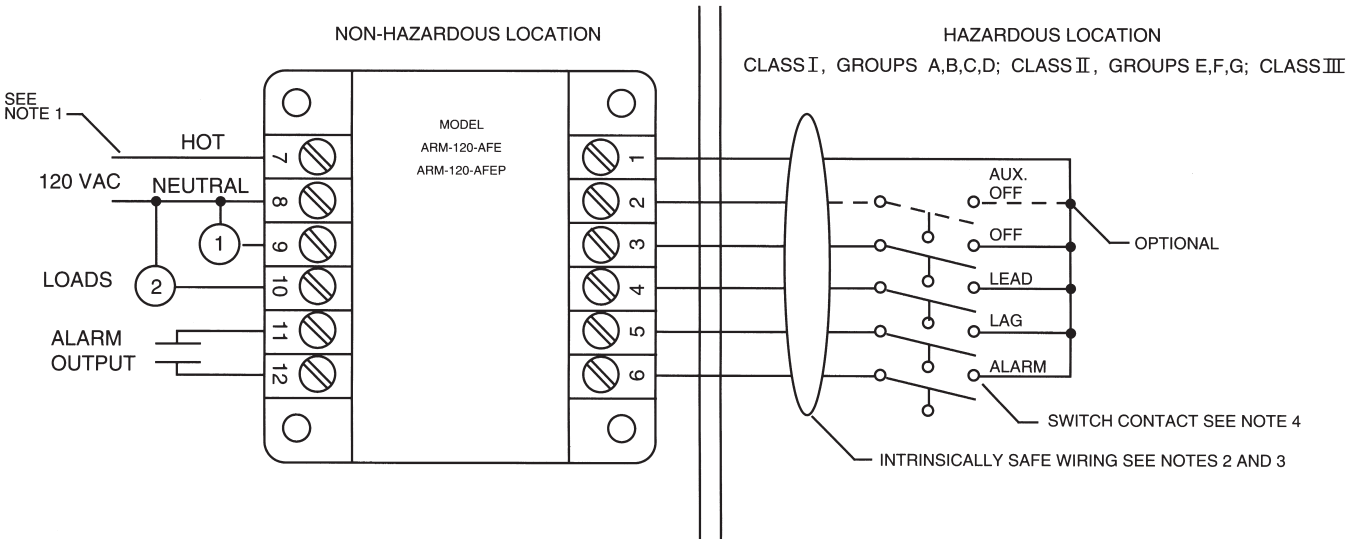
*Panel Mount Cutout



*Greenlee punch #60071 or equivalent

WIRING

CONTROL DRAWING 190

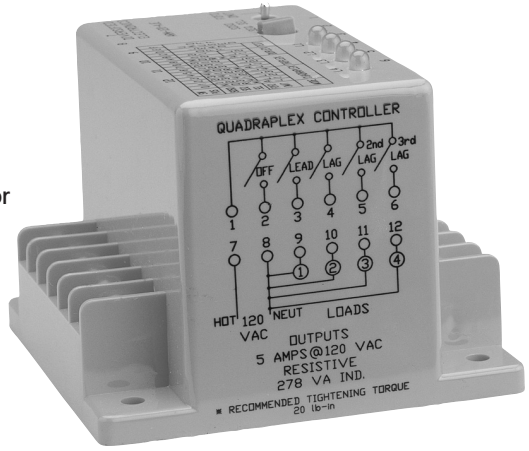


1. To maintain intrinsic safety, connect the Controller's Earth Ground Terminal 8 to the earth ground of the AC Power Supply feeder. The resistance between the Controller's Earth Ground Terminal and Earth Ground shall be less than 1 ohm.
2. Maximum distance between Controller and switch contact is 1000 feet.
3. All intrinsically safe wiring shall be separated from non-intrinsically safe wiring. Refer to article 504 of the National Electrical Code ANSI/NFPA 70 on procedures for intrinsically safe wiring.
4. Switch contact shall be any non-energy storing or generating mechanical switch type device containing no capacitance or inductance.

These **TRIPLEX** and **QUADRAPLEX CONTROLLERS** are available with either Sequence-On-Simultaneous-Off **(SOSO)** or First-On-First-Off **(FOFO)** output logic. The special function models are differentiated by a rotary switch that allows any output to be locked as the lead load or any one load to be omitted while sequencing only the remaining loads. In addition to load omission and lead selection, the expandable model can be set for 2, 3, or 4 load operation with either SOSO or FOFO logic.

All models feature **INTRINSICALLY SAFE INPUTS** and logic that allows the outputs to operate properly even if one of the inputs fails to open or close. For example: if the off switch fails to close, the lead load will not energize until both the lead and the lag switches close. An inrush delay on all models reduces line sags by preventing multiple loads from energizing simultaneously.

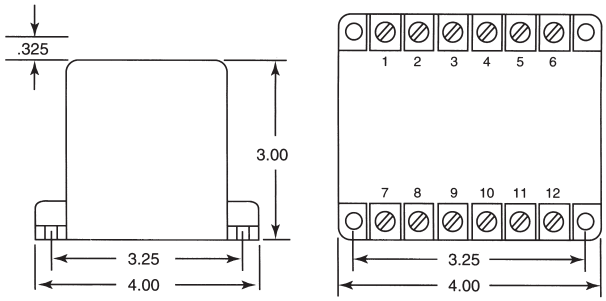
Process Control Equipment for Hazardous Locations 7M26 UL913



Alternating Controllers

- 3 and 4 Load Output Models
- 2-4 Load Expandable Model
- Intrinsically Safe Inputs

DIMENSIONS (INCHES)



MODEL NUMBER

MODEL NUMBER	ARM			E	
CONTROL VOLTAGE					
24 VAC		24A			
120 VAC		120A			
NO. OF LOADS	**OUTPUT LOGIC**	**SPECIAL FUNCTIONS**			
3	SOSO	none	A		
3	FOFO	none	B		
3	SOSO	Omit/Lead Select	C		
3	FOFO	Omit/Lead Select	D		
4	SOSO	none	G		
4	FOFO	none	H		
ENCLOSURE STYLE				E	
MOUNT					
No Suffix Surface Mount					
P Suffix Panel Mount					P

SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC ±10%, 50/60 Hz	
SWITCH VOLTAGE	5.1 Volts open circuit	
SWITCH CURRENT	10 µAmps short circuit	
POWER REQUIRED	2.5 VA	
SENSITIVITY	100 k ohm	
ISOLATION	2500V Input to Output	
DUTY CYCLE	Continuous	
RESPONSE	Power Up	< 1 SEC
	Operate	< 25 mSEC (switch closure)
	Inrush	5 SEC
	Release	< 150 mSEC
CONTACT RATING	All channels, SPST-N.O., 5 Amps per channel @ 24 or 120 VAC, Resistive; 278 VA, Inductive	
LED INDICATORS	ON when corresponding output is ON	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
TERMINATIONS	(12) #8-32 Screw terminals with pressure clamps	
ENCLOSURE	Style "E" Surface mount	
WEIGHT	16 oz.	

The ARM Series is UL Listed under UL File Number E151578.

OPERATION TRIPLEX CONTROLLERS

Intrinsically safe equipment and wiring is equipment and wiring which is incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most ignitable concentration. Intrinsically safe terminations and wiring may be brought into any hazardous location of any group classification for which it is accepted without requiring explosion-proof housing or other means of protection.

Hazardous locations are classified by the National Electrical Code according to the level of hazard that may exist in the area. A hazardous location is designated by its class, group and division. The class and group specify the specific hazardous substances that may exist in the classified location.

- Class I, Groups A through D – Flammable gasses
- Class II, Groups E through G – Combustible dusts
- Class III, Easily ignitable fibers or flyings

  The division indicates the conditions under which the hazardous substance may be present.

- Division I–Hazardous substances exist continuously or intermittently under normal operating conditions.
- Division II – Hazardous substances exist within closed containers or systems from which they can escape only in case of accidental rupture or breakdown.

The **ARM-120-AAE** and **ARM-120-ABE** Triplex Controllers have four switch inputs and three load outputs. The inputs are designated off, lead, lag and 2nd lag. If the off switch fails to close, the lead load will not energize until both the lead and lag switches close. De-energization of the loads depends on the output logic of the selected controller.

ARM-120-AAE (SOSO): The **ARM-120-AAE** has sequence-on simultaneous off output logic. As the 2nd lag, lag and lead switches open, the loads remain energized. When the off switch opens, all three loads de-energize simultaneously. If any switch fails to open, the loads still de-energize when the off switch opens. The lead advances one position each time the loads de-energize.

ARM-120-ABE (FOFO): The **ARM-120-ABE** has first-on-first-off output logic. When the 2nd lag switch opens, all three loads remain energized. The lag switch opens next, and the lead load de-energizes. When the lead switch opens, the lag load de-energizes. Finally, the off switch opens, and the second lag load de-energizes. At the end of each cycle the lead advances one position for each load energized during the cycle. For example: if loads one and two cycle on and off, the lead will advance two positions. Load three will be the lead load for the next cycle.

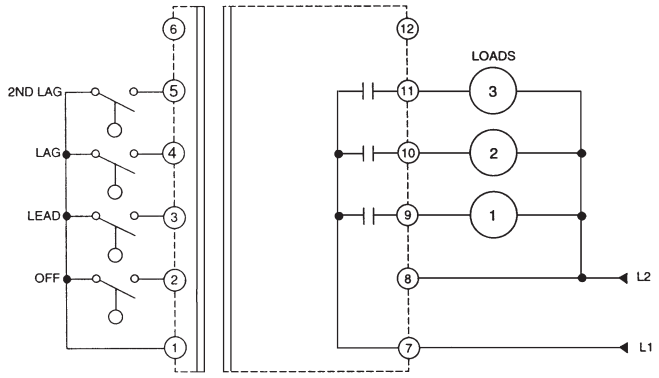
The **ARM-120-ACE (SOSO)** and **ARM-120-ADE (FOFO)** Special Function Triplex Controllers have the same features and operations as the ARM-120-AAE and ARM-120-ABE respectively with the addition of an eight-position field selection switch. The switch allows any one load to be omitted from the sequence or locked in the lead position. An automatic test mode is also provided for system verification and troubleshooting.

LOAD OMIT MODE: One load may be omitted from the sequence for general or emergency maintenance while alternating the remaining loads.

LEAD SELECT MODE: The controller may be locked into a desired sequence to equalize motor run time.

AUTOMATIC TEST MODE: The controller energizes the loads one at a time for five second intervals.

WIRING



FIELD SELECTION SWITCH

POS.	FUNCTION
0	NORMAL
1	1 2 3
2	2 3 1
3	3 1 2
4	OMIT L1
5	OMIT L2
6	OMIT L3
7	TEST

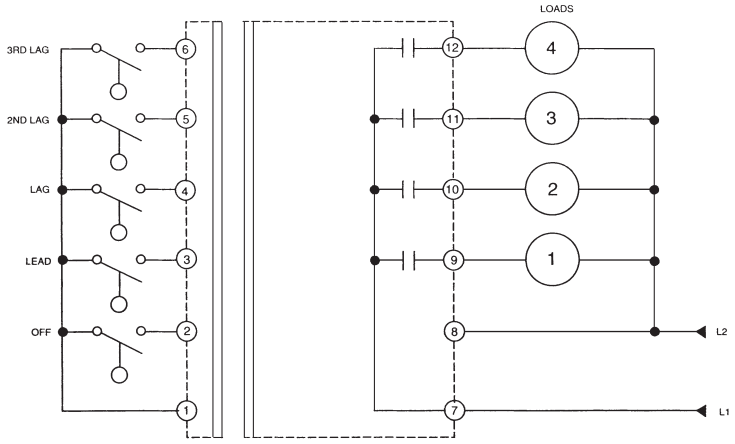
OPERATION QUADRAPLEX CONTROLLERS

The **ARM-120-AGE** and **ARM-120-AHE Quadraplex Controllers** have five switch inputs and four load outputs. The inputs are designated off, lead, lag, 2nd lag, and 3rd lag. With the off switch closed, the loads energize in sequence upon closure of the lead, lag, 2nd lag, and 3rd lag inputs. If the off switch fails to close, the lead load will not energize until both the lead and lag switches close. De-energization of the loads depends on the output logic of the selected controller.

ARM-120-AGE (SOSO): The **ARM-120-AGE** has sequence-on simultaneous off output logic. As the 3rd lag, 2nd lag, lag and lead switches open, the loads remain energized. When the off switch opens, all four loads de-energize simultaneously. If any switch fails to open, the loads still de-energize when the off switch opens. The lead advances one position each time the loads de-energize.

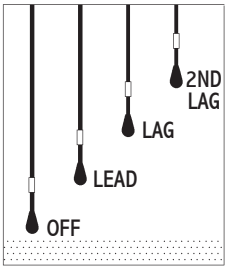
ARM-120-AHE (FOFO): The **ARM-120-AHE** has first-on-first-off output logic. When the 3rd lag switch opens, all four loads remain energized. The 2nd lag switch opens next, and the lead load de-energizes. When the lag switch opens, the lag load de-energizes. Next, the lead switch opens, and the 2nd lag load de-energizes. Finally, the off switch opens, and the 3rd lag load de-energizes. At the end of each cycle the lead advances one position for each load energized during the cycle. For example: if loads one and two cycle on and off, the lead will advance two positions. Load three will be the lead load for the next cycle.

WIRING



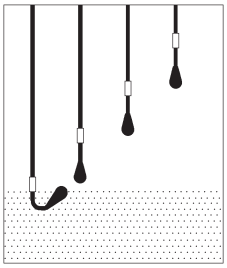
SOSO OPERATION

STEP 1



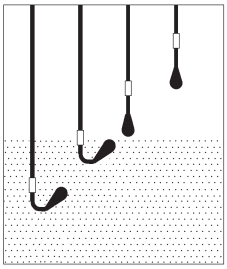
This example illustrates the normal operation of the Triplex Controller in a pump down application with four normally open dry float switches. The switches are designated off, lead, lag, and 2nd lag. The example begins with all switches open and all loads de-energized.

STEP 2



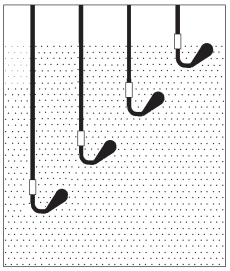
As the fluid level rises, the OFF switch closes, no loads are energized.

STEP 3



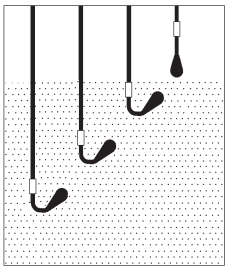
If the fluid level continues to rise, the lead switch closes and load 1 energizes.

STEP 4



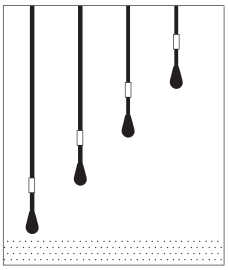
As the fluid level continues to rise each successive float switch closure sequentially energizes a corresponding load.

STEP 5



When the fluid level falls and each float switch opens, the loads remain energized so long as the OFF switch remains closed. No external auxiliary contacts are required to accomplish this latch feature.

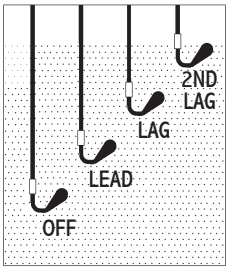
STEP 6



When the fluid level falls below the OFF switch, all loads simultaneously de-energize, and the alternating logic advances one position. The next rise and fall in fluid level and successive operation of load switches will result in the SOSO load operation as follows: 2-3-1, 3-1-2, and back to 1-2-3 as in Step 1.

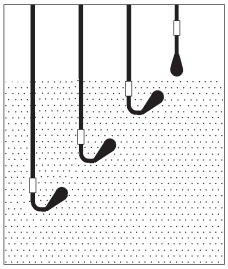
FOFO OPERATION

STEP 1



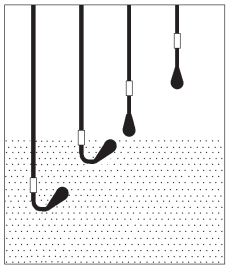
This example continues from SOSO operation step four. With all float switches closed, all loads are energized.

STEP 2



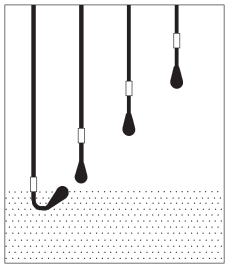
As the fluid level falls, the 2nd lag switch opens. All loads remain energized. Each float switch in descending order acts as the OFF switch for the preceding float.

STEP 3



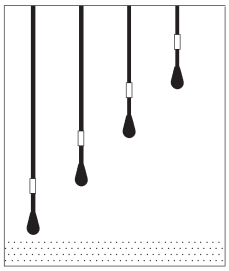
When the lag switch opens, load 1 de-energizes. Loads 2 and 3 remain energized.

STEP 4



When the lead switch opens, load 2 de-energizes. Load 3 is held on by the OFF switch.

STEP 5



When the OFF switch opens, load 3 de-energizes and the lead advances three positions. At the end of each cycle the lead advances one position for each load energized during the cycle. This particular example reverts back to SOSO OPERATION 1-4 wherein load 1 would again be the lead load.

INTRINSICALLY SAFE SINGLE & MULTIPLE CHANNEL INPUTS

Hazardous locations are classified by the National Electrical Code according to the level of hazard that may exist in the area. A hazardous location is designated by its class, group and division.

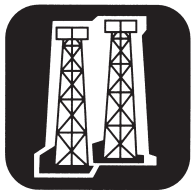
Class and group specify the type of hazardous substance that may exist in the classified location. The division indicates the conditions under which the hazardous substance may be present.

CLASS I
Locations in which flammable gases or vapors may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

GROUP A
Atmospheres containing acetylene.

GROUP B
Atmospheres containing hydrogen, gases or vapors of equivalent hazard, such as manufactured gas.

GROUP C
Atmospheres containing ethyl-ether vapors, ethylene or cyclopropane.



GROUP D
Atmospheres containing gasoline, hexane, naphtha, benzine, butane, propane, alcohol, acetone, benzol, lacquer solvent vapors or natural gas.

DIVISION I
Locations in which hazardous concentrations in the air exist continuously, intermittently or periodically under normal operating conditions.

CLASS II
Locations which are hazardous because of the presence of combustible dust.

GROUP E
Atmospheres containing metal dust including aluminum, magnesium and their commercial alloys and other metals of similarly hazardous characteristics.

GROUP F
Atmospheres containing carbon black, coal or coke dust.

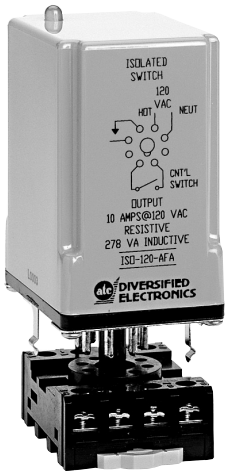
GROUP G
Atmospheres containing flour, starch or grain dusts.

CLASS III
Locations which are hazardous because of the presence of easily ignitable fibers or flyings, but in which such fibers or flyings are not likely to be in suspension in air in quantities sufficient to product ignitable mixtures.

DIVISION II
Locations in which hazardous concentrations are handled, processed or used but are normally confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown.

Process Control Equipment for Hazardous Locations
7M26
UL913

The ATC Diversified Electronics series of Isolated Switches have been tested and approved for listing under Underwriters Laboratories (UL) UL913 Intrinsically Safe Apparatus and Associated Apparatus. The input(s) to these switches have been approved for use in all classes, groups and divisions of hazardous locations.



Process Control Equipment
for Hazardous Locations
7M26
UL913

Single Channel Isolated Switch

SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH	Open Circuit Voltage	16 VDC
	Open Circuit Voltage	200 µAmps
RESPONSE	Operate	6 mSEC (Approx.)
	Release	2.5 mSEC (Approx.)
POWER REQUIRED	1.5 VA	
DUTY CYCLE	Continuous	
CONTACT RATING	SPST-N.O., 10 amps @ 24 or 120 VAC, Resistive; 278 VA, Inductive	
SENSITIVITY	100 k ohm	
ISOLATION	2500 Volts, Input to Output	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	On When Output is On	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw terminals	
WEIGHT	20 oz.	

ORDERING INFORMATION

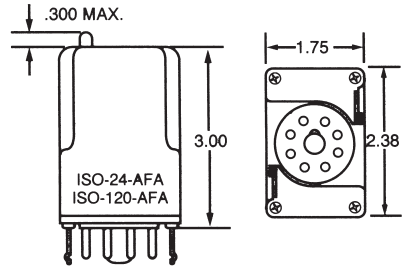
MODEL NUMBER	CONTROL VOLTAGE	ENCLOSURE STYLE
ISO-24-AFA	24 VAC	A
ISO-120-AFA	120 VAC	A
ISO-24-AFN	24 VAC	N
ISO-120-AFN	120 VAC	N

Style "A" Socket Included

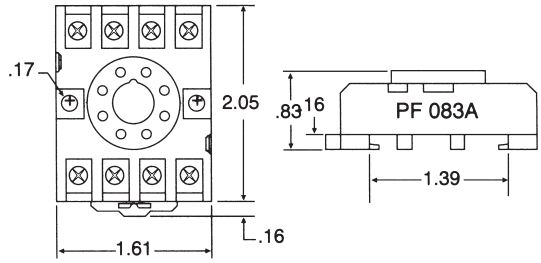
OPERATION

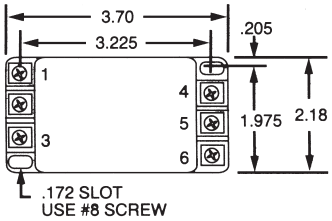
The **ISO Series single channel** devices are used to provide a safe and reliable means of controlling loads from hazardous locations without releasing sufficient energy, under normal or abnormal conditions, to cause ignition of a flammable or combustible atmospheric mixture while in its most easily ignited concentration. An isolated output turns on when the control switch input from the hazardous location is closed. When the control switch input opens, the isolated output turns off. The Style A single channel plug-in devices come equipped with integral spring mating clips which secure the device to the base make this unit the only UL913 Intrinsically Safe plug-in associated apparatus available on the market today. The Style N, surface mounted enclosure is sealed with a high quality epoxy resin material and has five (5) #8-32 screw terminals.

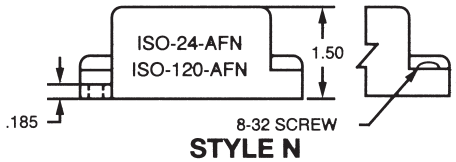
DIMENSIONS (INCHES)



STYLE A





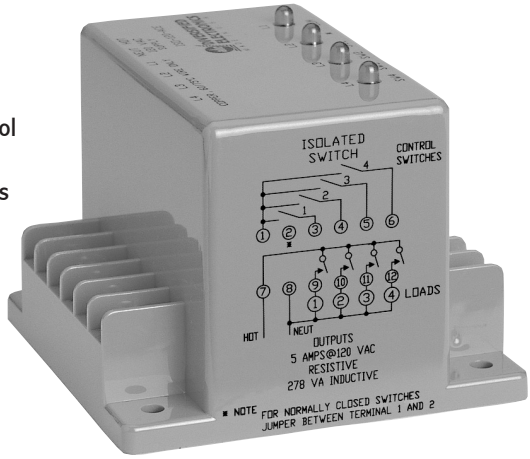


STYLE N

OPERATION

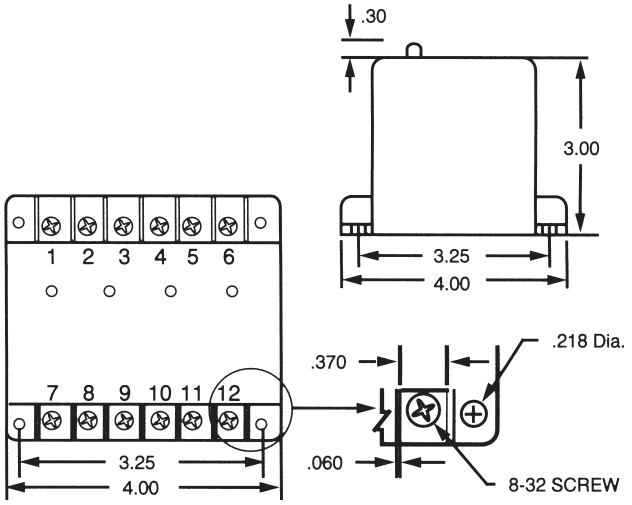
The **ISO/ISL Series multiple channel** devices are used to provide a safe and reliable means of controlling loads from hazardous locations without releasing sufficient energy under normal or abnormal conditions to cause ignition of a flammable or combustible atmospheric mixture while in its most easily ignited concentration. An isolated output turns on when the corresponding control switch input from the hazardous location is activated. When using normally closed control switch inputs, a jumper should be installed between terminals 1 and 2. Normally open control switch inputs do not require the optional jumper. When the **non-latching ISO Series** control switch input is activated, its corresponding output turns on. When the control switch input is deactivated, its output turns off. When the **latching ISL Series** control switch input 2, 3 or 4 is activated, its corresponding output turns on. When control switch 2, 3 or 4 is deactivated, its corresponding output remains latched on as long as control switch input 1 is activated; otherwise it turns off immediately. Control switch input 1 also controls output 1 just as in the non-latching ISO Series.

Process Control Equipment for Hazardous Locations 7M26 UL913



Multiple Channel Isolated Switch

DIMENSIONS (INCHES)



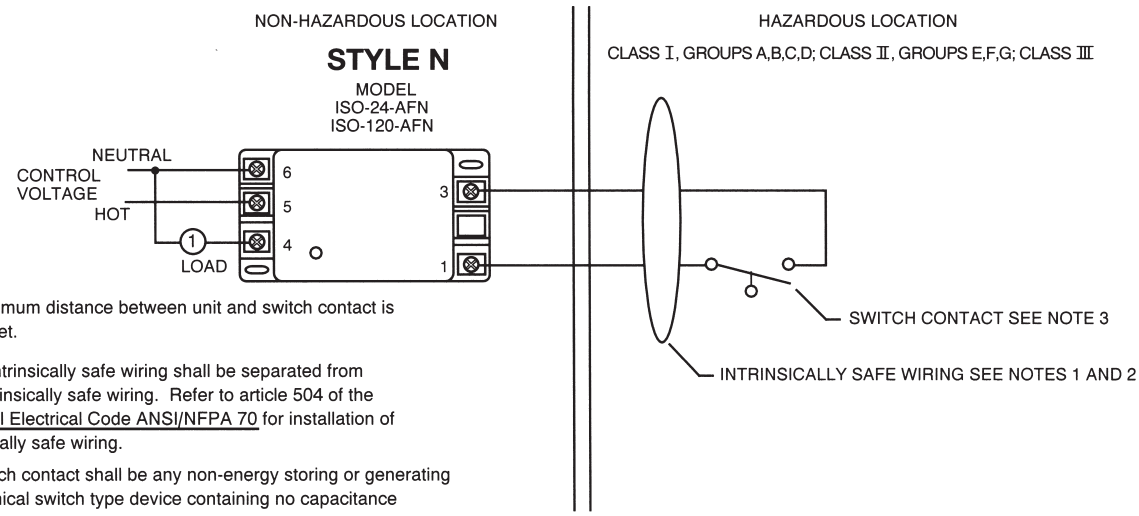
SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC ±10%, 50/60 Hz	
CONTROL SWITCH	Open Circuit Voltage	6.2 VDC
	Open Circuit Voltage	10 µAmps
RESPONSE TIMES	Operate	6 mSEC (Approx.)
	Release	2.5 mSEC (Approx.)
POWER REQUIRED	2.5 VA	
DUTY CYCLE	Continuous	
CONTACT RATING	SPST-N.O., 5 amps per channel @ 24 or 120 VAC, Resistive; 278 VA, Inductive	
ISOLATION	2500 Volts, Input to Output	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	On When Corresponding Output is On	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw terminals	
WEIGHT	8 oz.	

ORDERING INFORMATION

MODEL NUMBER	CONTROL VOLTAGE	CHANNELS
ISL-24-AAE	24 VAC	2
ISL-24-ABE	24 VAC	3
ISL-24-ACE	24 VAC	4
ISL-120-AAE	120 VAC	2
ISL-120-ABE	120 VAC	3
ISL-120-ACE	120 VAC	4
ISO-24-AAE	24 VAC	2
ISO-24-ABE	24 VAC	3
ISO-24-ACE	24 VAC	4
ISO-120-AAE	120 VAC	2
ISO-120-ABE	120 VAC	3
ISO-120-ACE	120 VAC	4

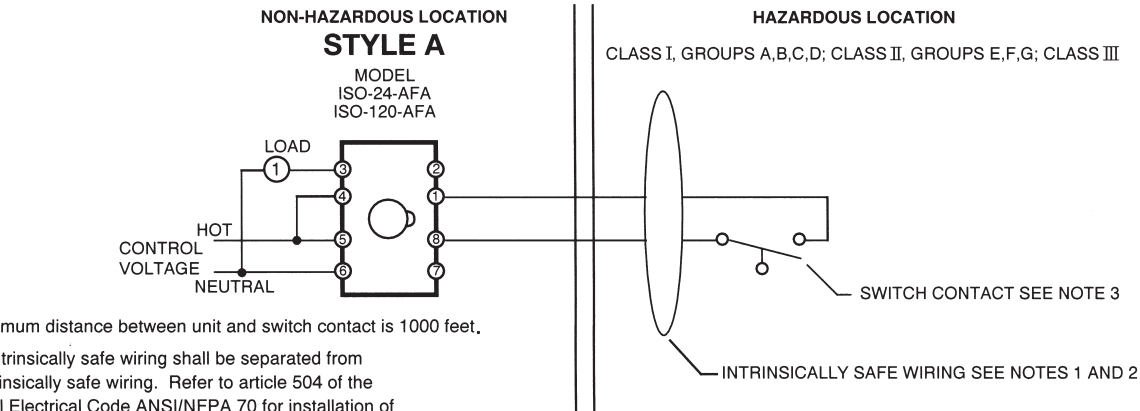
CONTROL DRAWING 191



NOTES:

1. Maximum distance between unit and switch contact is 1000 feet.
2. All intrinsically safe wiring shall be separated from non-intrinsically safe wiring. Refer to article 504 of the National Electrical Code ANSI/NFPA 70 for installation of intrinsically safe wiring.
3. Switch contact shall be any non-energy storing or generating mechanical switch type device containing no capacitance or inductance.

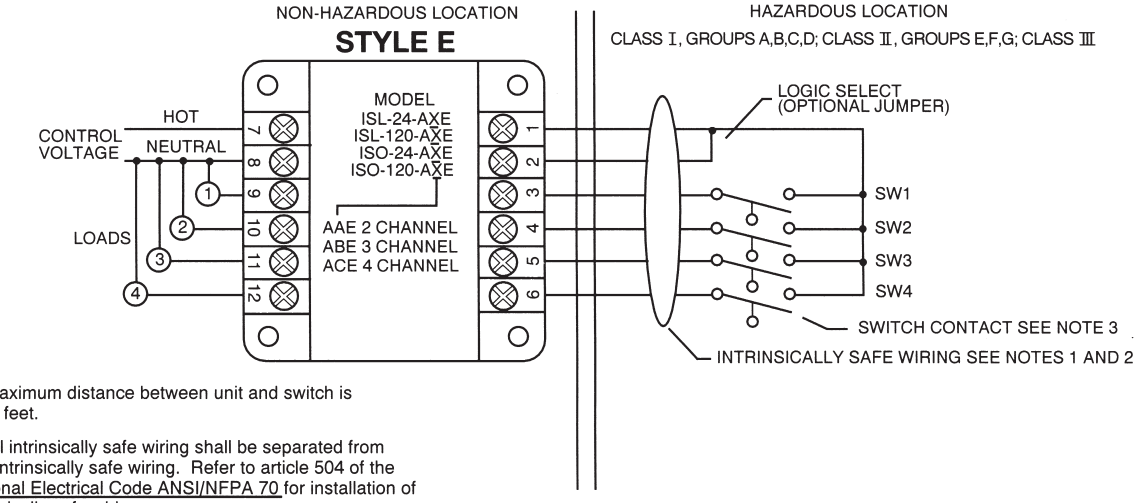
CONTROL DRAWING 192



NOTES:

1. Maximum distance between unit and switch contact is 1000 feet.
2. All intrinsically safe wiring shall be separated from non-intrinsically safe wiring. Refer to article 504 of the National Electrical Code ANSI/NFPA 70 for installation of intrinsically safe wiring.
3. Switch contact shall be any non-energy storing or generating mechanical switch type device containing no capacitance or inductance.
4. Unit must be installed with DE socket P/N PF083A.

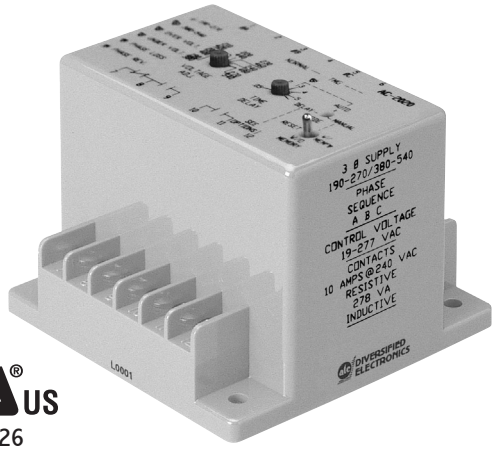
CONTROL DRAWING 193



NOTES:

1. Maximum distance between unit and switch is 1000 feet.
2. All intrinsically safe wiring shall be separated from non-intrinsically safe wiring. Refer to article 504 of the National Electrical Code ANSI/NFPA 70 for installation of intrinsically safe wiring.
3. Switch contact shall be any non-energy storing or generating mechanical switch type device containing no capacitance or inductance.
4. Wiring to terminals 5,6,11 and 12 is omitted for models with the suffix AAE.
5. Wiring to terminals 6 and 12 is omitted for models with the suffix ABE.

The **AC 2020 Compressor Protector** provides multimode **time delays, reset** selections and a **memory capability** which indicates using LED's, the last fault condition. This offers not only protection for the compressor in adverse electrical conditions but also a method to readily determine the type of fault occurrence.



E55826

3-Phase Compressor Protector

OPERATING VOLTAGE

AUTO RANGES	
240 VAC	190-270 VAC, Adj., 50/60 Hz
480 VAC	380-540 VAC, Adj., 50/60 Hz

SPECIFICATIONS

CONTROL VOLTAGE	24 or 120 VAC ±10%, 50/60 Hz	
TRIP POINTS	Under Voltage	-10% of Setting
	Over Voltage	+10% of Setting
	Hysteresis	5% of Nominal Setting
RESPONSE TIMES	Pick-Up	Auto Mode: 0.05 to 5 Min. (Adj) Delay-On-Make Delay Mode: 3 Min. (Fixed) Delay-On-Break
	Drop-Out	Over/Under Voltage, Phase Loss: 2 SEC (Approximately)
POWER REQUIRED	<5 VA	
MAXIMUM VOLTAGE	550 VAC	
PHASE SEQUENCE	ABC (Will Not Operate On CBA Sequence)	
OUTPUT RATING	278 VA Inductive; 10 Amps Resistive @ 240 VAC	
CONFIGURATION	Control	SPST-N.O.
	Auxiliary	SPDT
MODE SELECTIONS	Automatic; Manual; Delay-On-Break	
RESET SWITCH	With Memory, Without Memory, Auto Reset, Manual Reset	
TRANSIENT WITHSTAND	1500 V @ 8X 20 Microseconds	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "E" Lexan® Surface Mounted	
TERMINATIONS	(12) #8-32 Screw Terminals	
WEIGHT	6 oz.	

- Automatic Voltage Ranging
- Universal Control Voltage
- Condition/Fault Indicators
- Automatic/Manual Reset
- Last Fault Memory
- Delay-On-Make
- Delay-On-Break
- Auxiliary Contacts
- Easy Installation

PROTECTS AGAINST:

- Phase Loss
- Under Voltage
- Over Voltage
- Phase Reversal
- Short Cycling

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
AC-2020	3-Phase Compressor Protector

Delay-On-Break Timers

This family of **HVAC controls** provides **short cycle protection** by locking out the compressor for a period of time after a voltage or thermostat interruption. Subsequent interruptions will not increase the delay period. Since the delay begins when the interruption occurs, the temperature control is not affected. Under normal operating conditions, the compressor off time is longer than five (5) minutes. In this case, the use of these timers will not lengthen this off cycle.

This field adjustable model will operate on control voltages of 19 VAC through 288 VAC. Unlike most universal voltage timers, the **AC-503** is a two (2) terminal device that simply connects in series with the control voltage, thermostat and control relay making for easy installation. This timer is engineered to provide **true thermostat interruption protection** even when there is a continuous current flow through the thermostat's cooling anticipator.

NOTE: When used on 120/240 VAC control circuits, the external jumper should be cut. This disables the 24 VAC bypass circuit.

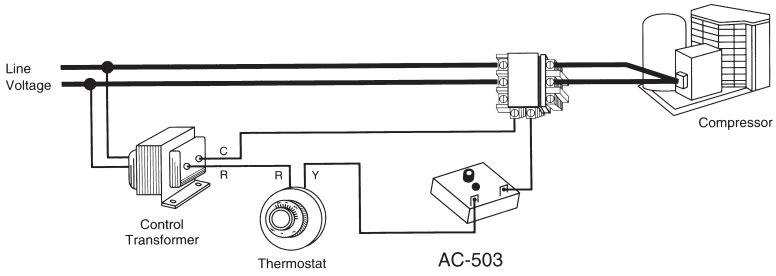
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
AC-503	Delay-On-Break Timer

SPECIFICATIONS

CONTROL VOLTAGE	24/120 or 208/240 VAC
OUTPUT RATING	250 VA Inrush; 25 VA Run @ 24 VAC, or 1250 VA Inrush; 125 VA Run @ 120/240 VAC
TIME DELAY	0.1 to 5 min. Adjustable
DIMENSIONS	2.0" x 2.0" x .75" high
WEIGHT	2.5 oz.

WIRING



The **AC-505-5** provides **short cycle protection** by locking out the compressor for a period of time after a voltage or thermostat interruption. Subsequent interruptions will not increase the delay period. Since the delay begins when the interruption occurs, the temperature control is not affected. Under normal operating conditions, the compressor off time is longer than five (5) minutes. In this case, the use of these timers will not lengthen this off cycle.

This is an easy to install, two (2) wire Short Cycle Timer that connects in series with the control voltage and control relay. The **AC-505** is engineered to provide **true thermostat interruption protection** even when there is continuous current flow through the thermostat's cooling anticipator.

Delay-On-Break Timer

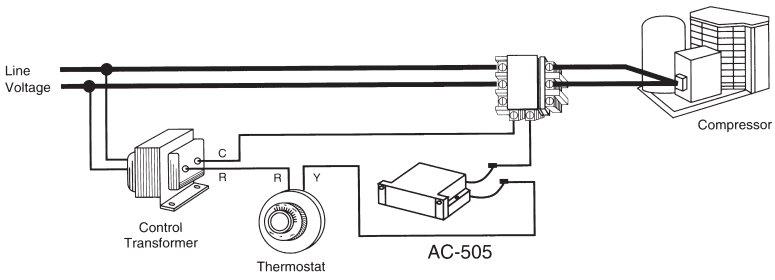
SPECIFICATIONS

CONTROL VOLTAGE	24 VAC
OUTPUT RATING	250 VA Inrush; 25 VA Run @ 24 VAC @ 77°F
TIME DELAY	5 min. ±20%
DIMENSIONS	2.65" x 2.13" x .875" high.
WEIGHT	3 oz.

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
AC-505-5	Delay-On-Break Timer

WIRING



c UL us
E55826

This family of controls provides **short cycle protection** by locking out the compressor for a period of time after a voltage or thermostat interruption. Subsequent interruptions will not increase the delay period. Since the delay begins when the interruption occurs, the temperature control is not affected. Under normal operating conditions, the compressor off time is longer than five (5) minutes. In this case, the use of these timers will not lengthen this off cycle.

These are easy to install two (2) terminal **Short Cycle Timers** that connect in series with the control voltage and control relay. The 24 VAC model employs a built-in bypass circuit for allowing continuous flow through the thermostat's cooling anticipator while the timer output is off.

Delay-On-Break Timer

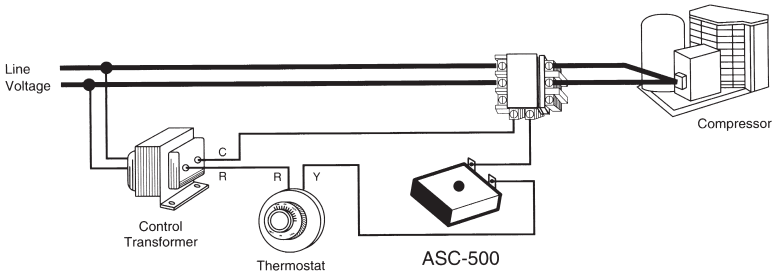
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ASC-500-5	5 Min. 24 VAC
ASC-501-5	5 Min. 120 VAC
ASC-502-5	5 Min. 240 VAC
ASC-501-3	3 Min. 120 VAC
ASC-502-3	3 Min. 240 VAC

SPECIFICATIONS

CONTROL VOLTAGE	ASC-500-5	24 VAC
	ASC-501-5 ASC-501-3	110/120 VAC
	ASC-502-5 ASC-502-3	208/240 VAC
OUTPUT RATING	ASC-500-5	250 VA Inrush; 25 VA Run @ 24 VAC
	ASC-501-5 ASC-501-3	1250 VA Inrush; 125 VA Run @ 120 VAC
	ASC-502-5 ASC-502-3	1250 VA Inrush; 125 VA Run @ 240 VAC
DIMENSIONS	2.0" x 2.0" x .75" high	
WEIGHT	3 oz.	

WIRING



The ATC Diversified **STAR PERFORMER** provides **short cycle protection** of **compressors** by delaying restart after a voltage or control circuit interruption. When the interruption occurs, the control relay drops out. The delay period begins when power is restored, providing random restart.

This **universal voltage** Delay-on-Make Short Cycle Timer provides the ultimate protection against short cycling of a compressor. The Star Performer offers true thermostat interruption protection even in 24 VAC control circuits.

The general conception of thermostat operation is that when the mercury tilts open, all control circuit current stops. The fact is that the cooling anticipator located inside most 24 volt thermostats does allow a small amount of current to flow (trickle current). This trickle current fools most Delay-on-Make Short Cycle Timers, as they will not reset as a result of this continuous current.

The **STAR PERFORMER** is engineered to provide true thermostat interruption protection even when the trickle current is present. The adjustable delay is ideal for providing random starting in multiple equipment installations.

NOTE: When used on 120/240 VAC control circuits, the external jumper should be cut. This disables the 24 VAC bypass circuit.

c UL us
E55826

"STAR PERFORMER"

Delay-On-Make Timers

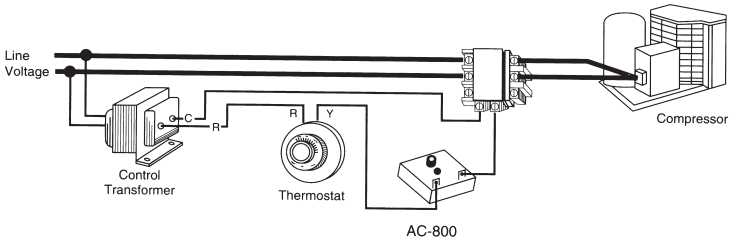
SPECIFICATIONS

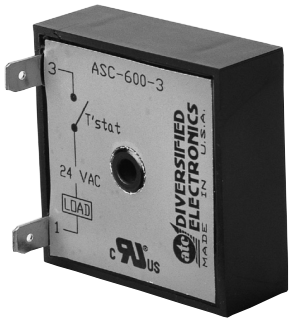
CONTROL VOLTAGE	24/120, 208/240 VAC
OUTPUT RATING	250 VA Inrush; 25 VA Run @ 24 VAC, or 1250 VA Inrush; 125 VA Run @ 120/240 VAC
TIME DELAY	0.2 to 8 min. Adjustable
WEIGHT	2.5 oz. to 3 oz.

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
AC-800	Delay-On-Make Timer

WIRING





c UL us
E55826

Delay-On-Make Timer

The **ASC-600 Series** provides short cycle protection of compressors by delaying restart after a voltage or control circuit interruption. When the interruption occurs, the control relay drops out. The delay period begins when power is restored, providing random restart.

These are easy to install, two (2) terminal short cycle timers that connect in series with the control voltage and control relay. The 24 VAC models employ a built-in bypass circuit for allowing continuous current flow through the thermostat's cooling anticipator while the timer output is off.

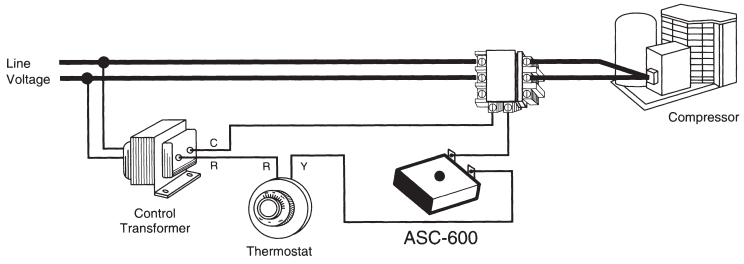
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
ASC-600-3	24 VAC Delay-On-Make Timer
ASC-601-3	120/240 VAC Delay-On-Make Timer

SPECIFICATIONS

CONTROL VOLTAGE	ASC-600-3	24 VAC
	ASC-601-3	120/240 VAC
OUTPUT RATING	ASC-600-3	250 VA Inrush; 25 VA Run @ 24 VAC
	ASC-601-3	1250 VA Inrush; 125 VA Run @ 120/240 VAC
TIME DELAY	3 min. ±20%	
WEIGHT	3 oz.	

WIRING



The **AC-410 Series** are plug in Phase Sequence and Loss Monitors that protect 3 phase refrigeration equipment from adverse line conditions such as:

PHASE LOSS (SINGLE PHASING): When any one phase drops to 83% or less of the adjustment setting.

UNDER VOLTAGE (BROWN OUTS): When all three phase voltages drop to 90% or less of the adjustment setting.

PHASE REVERSAL (IMPROPER SEQUENCE): When the wrong sequence is applied to the equipment.

STYLE A

Phase Sequence & Loss Monitor

OPERATION

When any of the mentioned occurs, the internal control relay drops out and a 3 minute delay-on-break time delay begins. This delay is used to lock out the compressor, allowing time for head pressure to equalize. When the delay has completed, the relay will re-energize provided all conditions are corrected and the external control voltage is present on terminals six (6) and seven (7). A green indicator glows when all line conditions are normal and a red indicator shows when the timer is in its delay.

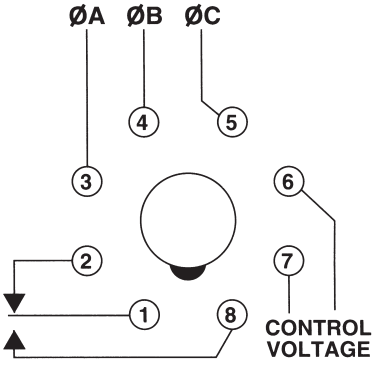
SPECIFICATIONS

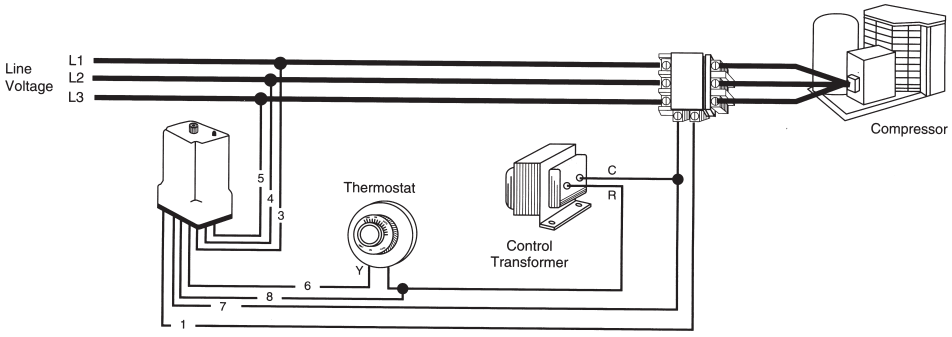
DROP OUT	1 Ø Low	83% of Adjustment Setting
	3 Ø Low	90% of Adjustment Setting
PHASE SEQUENCE	ABC (Will Not Operate CBA)	
TIME DELAYS	Operate	3 Minutes ±20%
	Release	100 Milliseconds
OUTPUT RATING	**AC-410**	SPDT, 10 Amps @ 240 VAC, Resistive; 470 VA, Inductive.
	AC-411 & AC-412	SPDT, 10 Amps @ 240 VAC, Resistive; 180 VA, Inductive
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	Style "A"	
WEIGHT	7 oz.	

ORDERING INFORMATION

Consult factory for available models.

WIRING





Single Phase Under/Over Voltage Monitor

The **CV-100** and **200 Series** are **Under/Over Voltage Monitors** combined with short cycle protectors used for **appliance control**. These units employ a user selectable voltage range Set Point switch.

OPERATION

This switch should be positioned to match the line voltage for proper operation. When the line voltage goes below (brown out) or above the preselected operating range, the internal relay drops out removing the plugged-in appliance from these adverse fault conditions. When the voltage returns to the normal operating range, a five (5) minute delay begins. Upon completion, the internal relay picks up allowing the plugged-in appliance to start. LED indicators give an immediate visual reference as to the status of the control. The GREEN LED indicates conditions are normal. When a fault condition occurs the GREEN LED will extinguish and the RED LED will glow. When a fault condition has been corrected, the RED LED will begin to flash. The RED LED will continue to flash until the five (5) minute delay period elapses. At the end of the delay period the RED LED will extinguish and the GREEN LED will glow. When both LED's are extinguished, a total loss of power is indicated.

The **CV-XXX-AFN** Series monitors under voltage only and do not feature LED indicators. They also incorporate the five (5) minute short cycle delay. This style is epoxy encapsulated to protect against adverse environmental conditions.

MODEL NUMBER	SET POINT	VOLTAGE 50/60 HZ	UNDER VOLTAGE DROP OUT	UNDER VOLTAGE PICK UP	OVER VOLTAGE PICK UP	OVER VOLTAGE DROP OUT	OUTPUT RATING RUN	OUTPUT RATING LOCK ROTOR	RECEPTACLE STYLE	WEIGHT
CV-100RS	110	110 VAC	87 VAC	95 VAC	120 VAC	128 VAC	15A	40A		8.5 oz
	120	120 VAC	95 VAC	103 VAC	131 VAC	140 VAC	15A	40A		
CV-200RS-15	230	230 VAC	190 VAC	198 VAC	243 VAC	253 VAC	15A	52A		8.5 oz.
	240	240 VAC	202 VAC	210 VAC	258 VAC	268 VAC	15A	52A		
CV-200RS-20	230	230VAC	190 VAC	198 VAC	243 VAC	253 VAC	20A	72A		8.5 oz
	240	240 VAC	202 VAC	210 VAC	258 VAC	268 VAC	20A	72A		
CV-120-AFN	N/A	120 VAC	95 VAC	103 VAC	N/A	N/A	20A	52A	Not Applicable 1/4" quick" disconnect terminals	8.5 oz.
CV-230-AFN	N/A	230 VAC	190 VAC	198 VAC	N/A	N/A	20A	52A		
CV-240-AFN	N/A	240 VAC	202 VAC	210 VAC	N/A	N/A	20A	52A		

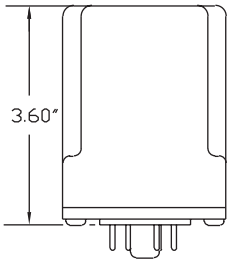
OPERATION

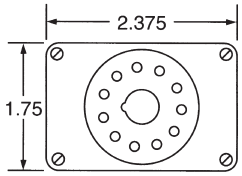
The ATC Diversified **SPM Series** Single Channel Seal Failure module is a specialized control for monitoring the **shaft seal** of a **submersible pump motor**. A leak is detected by sensing the position of a resistive float switch installed in the seal cavity. When the resistance drops below the sensitivity rating, the output relay energizes and the LED illuminates.

c UL us
E55826

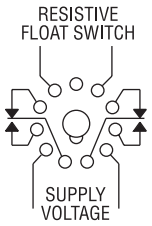
Single Channel Seal Failure Alarm

DIMENSIONS (INCHES)





WIRING



RB-11/PF013A

SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
SWITCH VOLTAGE	9 VDC	
ISOLATION	2500 Volts	
POWER REQUIRED	2 VA	
DUTY CYCLE	Continuous	
SENSITIVITY	470 Ω ±10% Fixed 470 Ω to 10K Ω ±10% Adjustable 4.7K Ω to 100K Ω ±10% Adjustable	
CONTACT RATING	DPDT, 10 A @ 250 VAC Resistive, 360 VA Inductive	
RESPONSE TIMES	Operate	15 ms (approximately)
	Release	8 ms (approximately)
LIFE EXPECTANCY	Mechanical 10,000,000 Operations (Minimum)	
	Electrical 50,000 Operations @ Rated Load	
INDICATORS	Red LED illuminates when leak is detected	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	11-Pin plug-in "A" style enclosure	
WEIGHT	8 oz.	

MODEL NUMBER

MODEL NUMBER	SPM	120	AAA	
SENSITIVITY				
470 Ω ±10% Fixed				470
470 Ω to 10K Ω ±10% Adjustable				10K
4.7K Ω to 100K Ω ±10% Adjustable				100K

c UL us
E55826

OPERATION

The ATC Diversified Electronics **SPM Series *dual* Seal Failure** module is a specialized control for monitoring the shaft seals of ***two* submersible pump motors**. Leaks are detected by sensing the conductivity of the contaminating fluid through probes installed in the seal cavity. When a seal begins to leak, the seal failure module energizes one of its SPST output relays indicating that the seal needs to be replaced before the motor is damaged. The sensitivity of the probe inputs is field adjustable. When the resistance between one of the probe inputs and the common connection drops below the sensitivity setting, the corresponding output relay and LED are activated.

Dual Channel Seal Failure Alarm

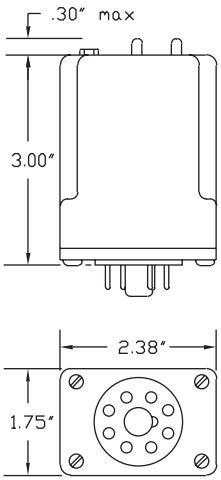
SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
SWITCH VOLTAGE	9 VDC	
ISOLATION	2500 Volts	
POWER REQUIRED	2 VA	
DUTY CYCLE	Continuous	
SENSITIVITY	10K Ω to 25K Ω ±10% Adjustable 4.7K Ω to 100K Ω ±10% Adjustable	
CONTACT RATING	(2) SPST-N.O., 5 A @ 120 VAC Resistive, 345 VA Inductive	
LIFE EXPECTANCY	Mechanical	20 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	Red LED illuminates when leak is detected	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	8-Pin plug-in "A" style enclosure	
WEIGHT	8 oz.	

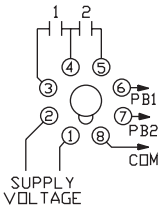
MODEL NUMBER

MODEL NUMBER	SPM	120	ABA	
SENSITIVITY				
10K Ω to 25K Ω ±10% Adjustable				25K
4.7K Ω to 100K Ω ±10% Adjustable				100K

DIMENSIONS (INCHES)



WIRING



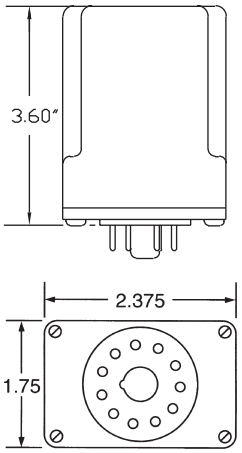
RB-08/PF083A

OPERATION

The non-volatile **Latching Temperature Switch** relay monitors a normally-closed-low temperature switch. It incorporates a bistable relay that retains its state during power failures. LEDs indicate the status of the relay, and connections for an external reset button are provided for manual control. The reset inputs of multiple units may be connected to a single push button as long as proper polarity is observed when making the connections. Under normal conditions the temperature switch is closed and the relay is de-energized. When the temperature switch opens, the relay energizes and latches on until the temperature switch re-closes and the reset button is pressed. The unit will function properly with zero to 2k Ω of resistance in series with the temperature switch.

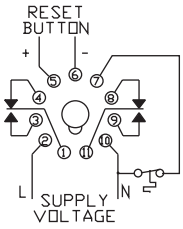
Temperature Switch Relay

DIMENSIONS (INCHES)



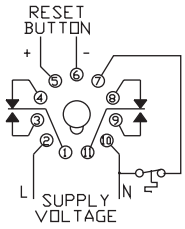
WIRING

ACA



RB-11/PF013A

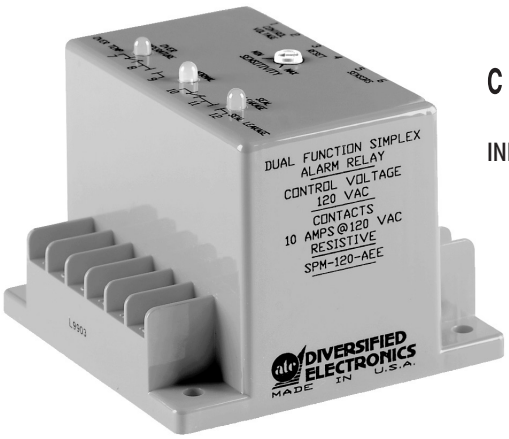
ADA



RB-11/PF013A

SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
POWER REQUIRED	2 VA	
DUTY CYCLE	Continuous	
CONTACT RATING	SPM-120-ACA	SPDT, 10 A @ 250 VAC, Resistive, 360 VA Ind.
	SPM-120-ADA	DPDT, 10 A @ 250 VAC, Resistive, 360 VA Ind.
RESPONSE TIMES	Operate	10 ms (approximately)
	Release	1 SEC (approximately)
LIFE EXPECTANCY	Mechanical	30 Million Operations
	Electrical	50,000 Operations @ Rated Load
INDICATORS	SPM-120-ACA	Green LED illuminates under normal conditions Red LED illuminates under fault conditions
	SPM-120-ADA	None
TEMPERATURE SWITCH	Voltage	12 VDC
	Current	2 mA max.
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	11-Pin plug-in "A" style enclosure	
WEIGHT	8 oz.	



c UL us
LISTED
IND. CONT. EQ.
496Y

The ATC Diversified **Submersible Pump Monitor** is a specialized control for monitoring the **shaft seal** and stator **temperature** of a **submersible pump motor.** Seal leakage is detected by either a resistive float switch or a pair of conductive probes installed in the seal cavity. Over-temperature is detected by a normally-closed-low temperature switch mounted on the stator. The over-temperature function incorporates a bistable relay that retains its position during power failures.

Submersible Pump Monitor

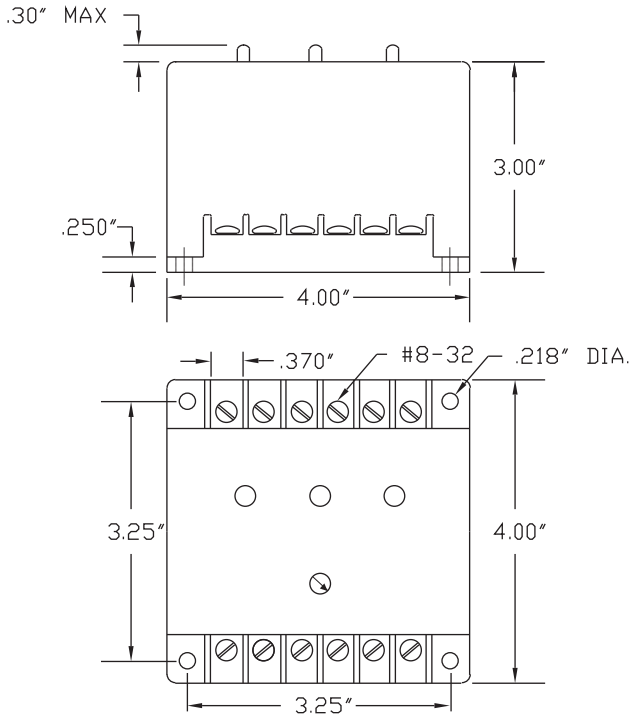
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
SPM-120-AEE	Dual Function Alarm/Relay

SPECIFICATIONS

CONTROL VOLTAGE	120 VAC, 50/60 Hz	
SENSOR VOLTAGE	12 VDC	
POWER REQUIRED	4 VA	
DUTY CYCLE	Continuous	
SENSITIVITY	Leakage	1K Ω to 35K Ω adjustable
	Over-Temperature	Open Circuit
CONTACT RATING	(2) SPDT, 10 A @ 120 VAC Resistive	
LIFE EXPECTANCY	Mechanical	10 Million Operations
	Electrical	100,000 Operations @ Rated Load
INDICATORS	Green LED illuminates under normal conditions Red LED illuminates when leak is detected Red LED illuminates on over-temperature	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
RESPONSE TIMES	Leakage Trip	1 SEC
	Leakage Reset	1 SEC
	Temperature Trip	0.1 SEC
TERMINATIONS	(12) #8-32 Screw Terminals	
ENCLOSURE	Style "E" Lexan® Surface Mounted	
WEIGHT	17 oz.	

DIMENSIONS (INCHES)

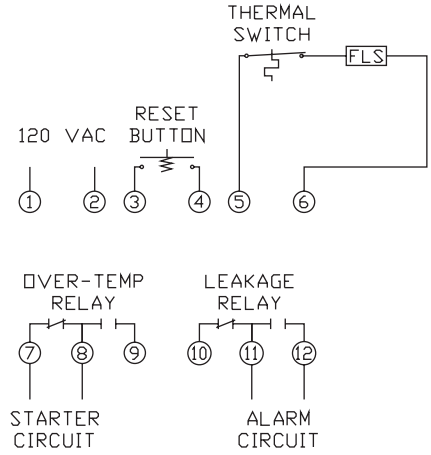


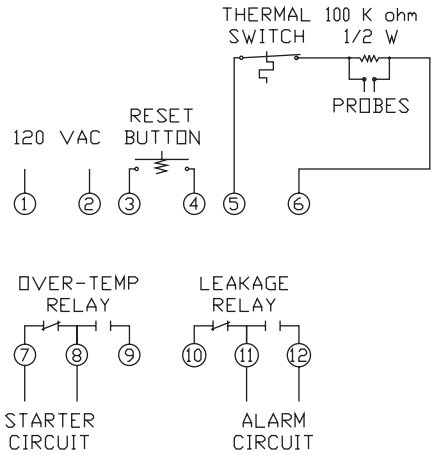
OPERATION

Figure 1 shows the connections for use with a Flygt model FLS float switch. The leakage sensitivity must be adjusted to 1 k for float switch applications. If a pair of conductive probes is used to sense seal leakage, a 100 k resistor is required as shown in Figure 2, and the sensitivity should be set to the desired value.

The states of the unit's relay outputs are determined by the series combination resistance of the leakage and temperature sensors. Under normal conditions the resistance remains between the leakage and over-temperature sensitivities, and both output relays are de-energized. If the temperature switch opens, the over-temperature relay latches on until the remote reset button is pressed. Two conditions must be met for reset to occur: power must be applied and the temperature switch must be closed. If the leakage sensor resistance drops below the leakage sensitivity setting, the leakage relay energizes. When the leakage condition clears, the relay resets automatically.

WIRING





Phase Rotation Tester

The **PRT-100** is a hand-held tester that takes the guesswork out of connecting a 3-phase motor. The direction of rotation of a motor depends on **phase sequence** of the power line connections. If the sequence is reversed, the motor will run in the wrong direction, possibly damaging the equipment connected to the motor. The **PRT-100** identifies the leads of a three-phase motor and detects the sequence of a three-phase power line. Once the motor and line leads are properly identified, the motor can be wired so that it turns in the desired direction on the first try. The unit also detects phase loss and no voltage conditions.

SPECIFICATIONS

SUPPLY VOLTAGE	20 to 600 VAC, 50/60/400 Hz	
SENSOR VOLTAGE	12 VDC	
ABSOLUTE MAXIMUM VOLTAGE	700 VAC, Phase-to-Phase	
BATTERY	9V, Included	
ISOLATION	3000 VAC, Leads to User	
ROTATION/ SEQUENCE	Red	Phase Loss/No Voltage
	Yellow	Low Battery
OPERATOR CONTROL	Momentary Test Button	
INDICATORS	Green	Normal Rotation/Sequence
	Red	Reverse
TEMPERATURE	Operate	32° to 113°F (0° to +45°C)
	Storage	-40° to 140°F (–40° to +60°C)
RESPONSE TIMES	100ms	
LEADS	18", color coded, battery clip type	
DIMENSIONS	3.75 x 2.625 x 1.5 inches	
WEIGHT	NET: 4.16 oz	

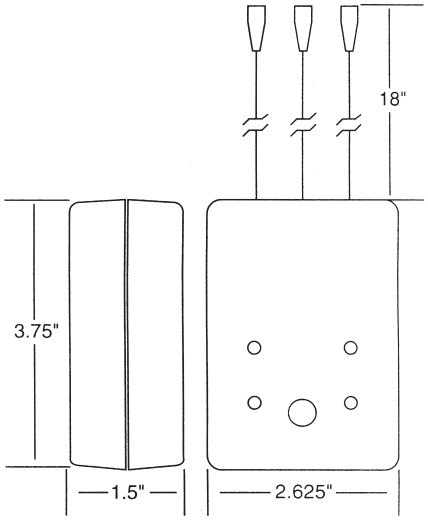
OPERATION

To identify the leads of a three-phase line, connect the tester to the energized line and press the test button. Either the normal or reverse LED will glow. If the reverse LED glows, switch two leads and press the test button again. The normal LED should now glow. Label the three-phase line conductors according to the marking on the tester. If the loss LED glows, a phase loss or no voltage condition exists, and the normal and reverse LEDs are meaningless. Correct the loss condition and retest.

To identify the leads of a three-phase motor, connect the tester to the de-energized motor, turn the rotor in the desired direction, and press the test button. If the reverse LED glows, switch two leads and repeat. The normal LED should now glow. Label the motor leads according to the markings on the tester. NOTE: the loss LED will glow during motor testing. This is normal since the turning motor generates less than 20 volts.

De-energize the three-phase line and connect the line conductors to the matching motor leads. When the motor is energized, it will run in the desired direction.

DIMENSIONS (INCHES)



ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
PRT-100	Phase Rotation Test

The **UPA-100 Power Alert** reduces the risk **of electrical arc flash** by pre-verifying the electrical isolation from outside of a control panel. Hard wired to the circuit breaker or main disconnect, the UPA flashes whenever voltage is present. Engineered with **redundant circuitry**, the Power Alert is powered by the same voltage that it indicates.

c UL us
LISTED
IND. CONT. EQ.
496Y

UL TYPE
4X

OPERATION

The eight detector UPA-100 visually alerts to the presence of dangerous AC or DC (Stored Energy) potentials occurring between any combination of the four monitored input lines (L1, L2, L3, GND). Two LED indicators are assigned to each input line and are designated "+" and "-". For each input line carrying an AC potential (bi-polar), both the "+" and "-" LEDs will be active. A DC or Stored Energy potential will illuminate the "+" LED for the positive line and the "-" LED for the negative line.

OSHA 1910.147 THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

Following the application of lockout or tagout devices to energy isolating devices, all potentially hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe. (d)(5)(ii)

If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation shall be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists. (d)(6)

"Verification of Isolation." Prior to starting work on machines or equipment that have been locked out or tagged out, the authorized employee shall verify that isolation and de-energization of the machine or equipment have been accomplished.

SPECIFICATIONS

OPERATIONAL RANGE	AC Single or 3-Phase	40 to 600 VAC, 50/60/400 Hz, (LINE-TO-LINE or LINE-TO-GND)
	DC or Stored Energy	30 to 1000 VDC, (LINE-TO-LINE or LINE-TO-GND)
MAXIMUM RATED VOLTAGE	750 VAC/1000 VDC (LINE-TO-LINE or LINE-TO-GND)	
DETECTION THRESHOLDS	29 VAC 3-Phase, 40 VAC SINGLE-Phase, 27 VDC (TYP Cutoff)	
POWER CONSUMPTION	1.2 Watts @ 750 VAC (Approximately)	
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	NEMA 4X 105°C PVC, Totally Encapsulated for Environment Protection	
TERMINATIONS	(4) 8 ft, 18 AWG 1000V, UL-1452	
WEIGHT	9 oz.	

INDICATOR FLASH RATES (L1, L2, L3, GND)

3- Phase Line-To-Line (VAC)	<29	30	120	240	480	600	750
Flashes/Sec (Typical)	0	1.3	4.2	5.8	7.3	8.0	8.8
DC or Stored Energy (VDC)	<27	30	48	110	300	600	1000
Flashes/Sec (Typical)	0	1.6	2.5	4.5	6.9	8.8	9.1

GND DETECTOR THRESHOLDS (LEAKAGE ANY PHASE-TO-GROUND)

3- Phase Line-To-Line (VAC)	30	120	240	480	750
L1, L2, or L3 To Ground Continuity (OHMS)	2M	2M	3M	5M	7M
Detector Included Fault Current (µA)	7	26	38	60	67

DETECTOR INCLUDED FAULT CURRENT (PHASE-TO-GROUND SHORT)

3- Phase Line-To-Line (VAC)	30	120	240	480	750
0 OHM Phase-To-Ground Current (µA)	28	108	219	455	730

Universal Power Alert

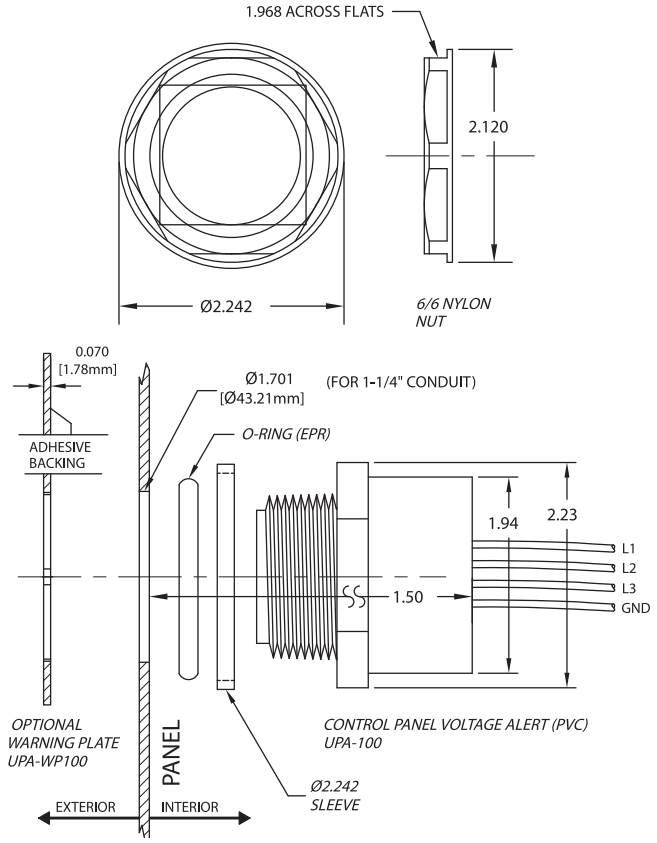
- Detects Single or 3-Phase AC & DC Voltage or Stored Energy
- Redundant Circuitry
- Verification of Zero Energy in a Panel
- Fits 1-1/4" Conduit Knock-Out

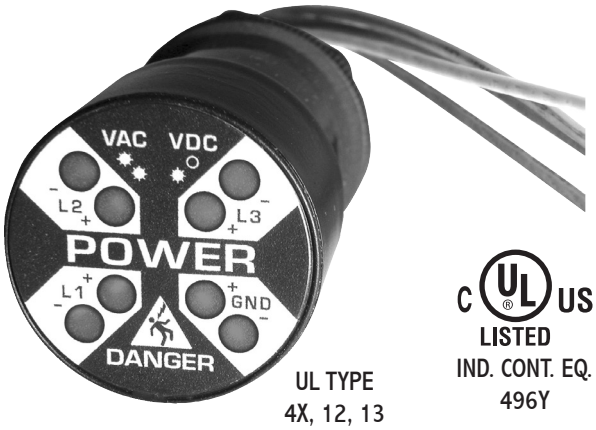
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
UPA-100	Universal Power Alert
UPA-100S	Universal Power Alert Solid-ON Red
Accessories UPA-WP100	WARNING Plate

The UPA-100 Series is UL Listed under UL File Number E55826.

DIMENSIONS (INCHES)





UL TYPE
4X, 12, 13

c UL us
LISTED
IND. CONT. EQ.
496Y

The **UPA 130 Power Alert** reduces the risk of **electrical arc flash** by pre-verifying the electrical isolation from outside of a control panel. Hard wired to the circuit breaker or main disconnect, the UPA flashes whenever voltage is present. Engineered with redundant circuitry, the Power Alert is powered by the same voltage that it indicates.

OPERATION

The eight detector UPA-130 visually alerts to the presence of dangerous AC or DC (Store Energy) potentials occurring between any combination of the four monitored input lines (L1, L2, L3, GND). Two LED indicators are assigned to each input line and are designated "+" and "-". For each input line carrying an **AC potential** (bi-polar) , both the "+" and "-" LEDs will be active. A DC or **Stored Energy potential** will illuminate the "+" LED for the positive line and the "-" LED for the negative line.

The UPA-130 Series is UL Listed under UL File Number E55826.

30mm Universal Power Alert

- Verification of Stored Energy Inside A Panel
- Fits 30mm Knockout
- Redundant Circuitry
- 40-750 VAC, 30-1000 VDC

SPECIFICATIONS

OPERATIONAL RANGE	AC SINGLE OR 3-PHASE	40 to 600 VAC, 50/60/400 Hz, (LINE-TO-LINE or LINE-TO-GND				
	DC OR STORED ENERGY	30 to 1000 VDC, (LINE-TO-LINE or LINE-TO-GND)				
MAXIMUM RATED VOLTAGE	750 VAC/1000 VDC (LINE-TO-LINE or LINE-TO-GND)					
DETECTION THRESHOLDS	29 VAC 3-Phase, 40 VAC SINGLE-Phase, 27 VDC (TYP CUTOFF)					
POWER CONSUMPTION	1.2 Watts @ 750 VAC (Approximately)					
TEMPERATURE RATING	Operate	-4° to 131°F (-20° to +55°C)				
	Storage	-40° to 185°F (-40° to +85°C)				
ENCLOSURE	Totally Encapsulated for Environment Protection					
TERMINATIONS	(4) 6 ft, 18 AWG 1000V, UL-1452	RED L1	YEL L2	BLU L3	GRN/YEL GRD	
WEIGHT	7 oz.					

INDICATOR FLASH RATES (L1, L2, L3, GND)

3- Phase Line-To-Line (VAC)	<29	30	120	240	480	600	750
Flashes/Sec (Typical)	0	1.3	4.2	5.8	7.3	8.0	8.8
DC or Stored Energy (VDC)	<27	30	48	110	300	600	1000
Flashes/Sec (Typical)	0	1.6	2.5	4.5	6.9	8.8	9.1

GND DETECTOR THRESHOLDS (LEAKAGE ANY PHASE-TO-GROUND)

3- Phase Line-To-Line (VAC)	30	120	240	480	750
L1, L2, or L3 To Ground Continuity (OHMS)	2M	2M	3M	5M	7M
Detector Included Fault Current (µA)	7	26	38	60	67

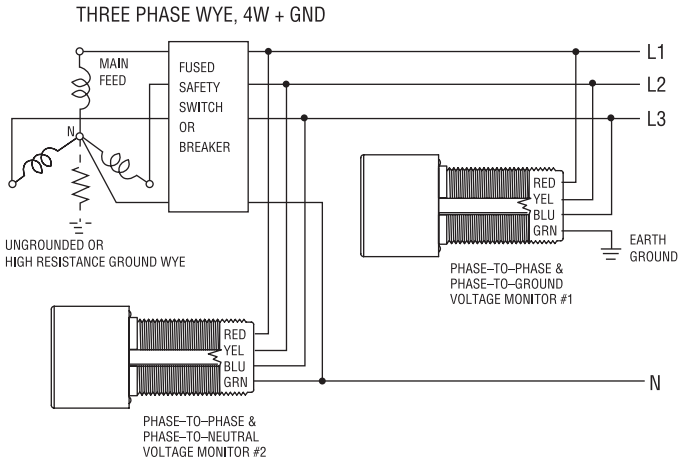
DETECTOR INCLUDED FAULT CURRENT (PHASE-TO-GROUND SHORT)

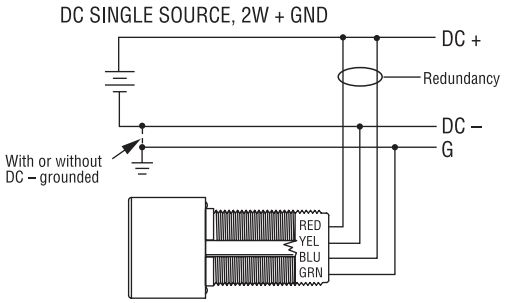
3- Phase Line-To-Line (VAC)	30	120	240	480	750
0 OHM Phase-To-Ground Current (µA)	28	108	219	455	730

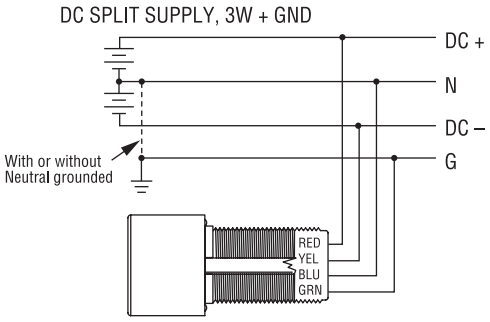
ORDERING INFORMATION

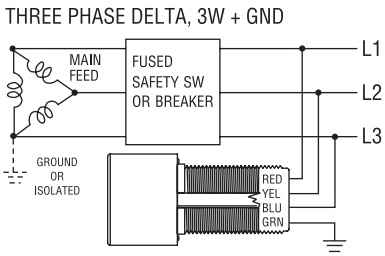
MODEL NUMBER	DESCRIPTION
UPA-130	30mm Universal Power Alert
UPA-130-DIV2	Class I, Div 2
UPA-130S	Solid ON
UPA-130-GOV	Amber LED
Accessories	
UPA-WP130	ANSI Warning Plate
UPA-BZL-130	Flush Mounting Kit for 1-1/4" for UPA 130 Conduit Knockout
UPA-BZL-DIV2	Bezel Kit for UPA-130 Div2
UPA-BZL-GOV	Bezel Kit for UPA-130 Gov
UPA-BZL-130S	Bezel Kit for UPA-130S

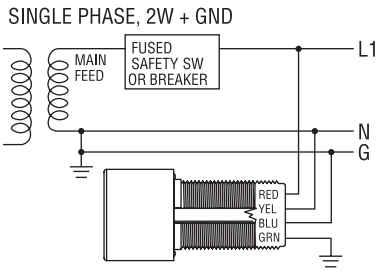
WIRING

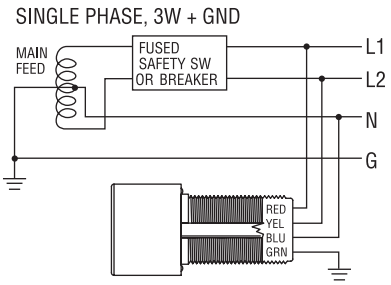




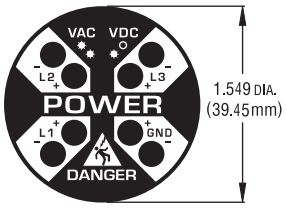


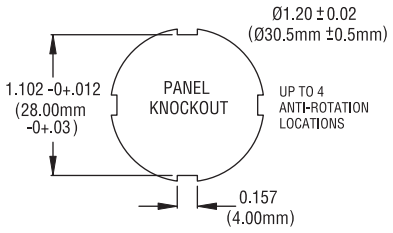


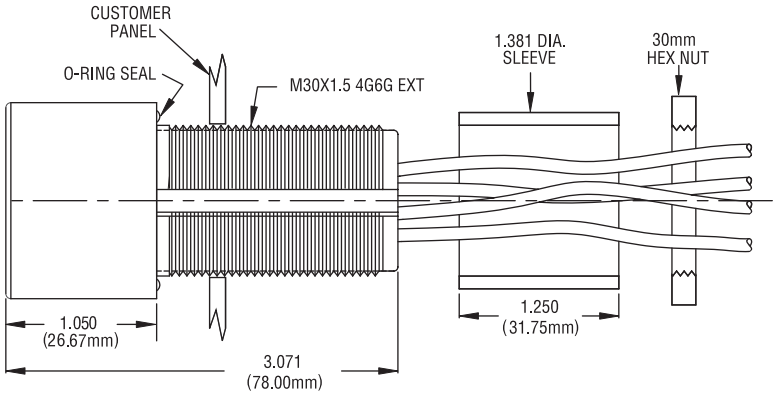


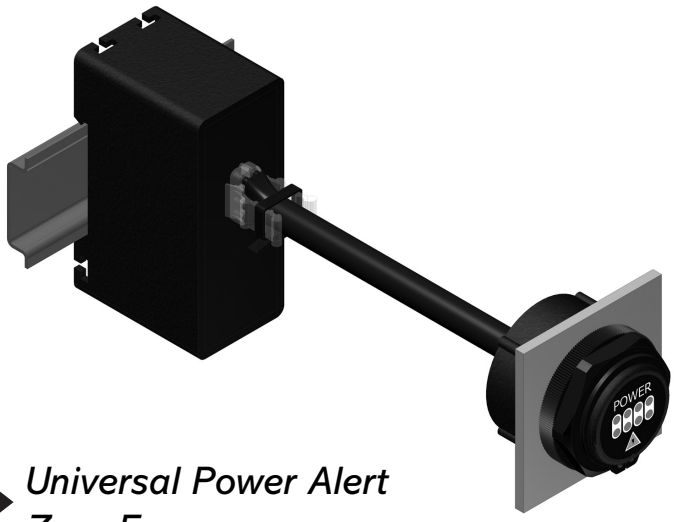


DIMENSIONS (INCHES)









Universal Power Alert Zero Energy

- Ideal for use in Lockout/Tagout Procedure
- Enhances NFPA 70E & OSHA Compliance
- Reduces Arc Flash & Electrocution Risk
- Detects Stored Energy
- Detects Ground Fault Problems
- No Voltage Present on Enclosure Door Panels
- DIN Rail or Surface Mounted Base

The **UPA-200 Power Alert** reduces the **risk of electrical** arc flash by pre-verifying the electrical isolation from outside of an electrical panel. Hard wired to the circuit breaker or main disconnect, the UPA LED's flash to indicate the presence of hazardous conditions (20-600 VAC & 20-1000 VDC) associated with stored energy. Engineered with redundant circuitry, the power alert is powered by the same voltage that it indicates. The unit is easily installed into the panels through a standard push-button 33mm knockouts.

The UPA-200 is ideal for mounting on the front controller door panel. The use of fiber-optics on this unit to transmit the LED lights to the enclosure door allows the unit to be mounted on an ungrounded door panel due to no voltage present on panel.

The eight detector UPA-200 visually alerts to the presence of dangerous AC or DC (Stored Energy) potentials occuring between any combination of the four minitored input lines (L1, L2, L3, GND). Two LED indicators are assigned to each input line are designate "+" and "–". For each input line carrying an AC potential (bi-polar), both the "+" and "–" LEDs will be active. A DC or Stored Energy potential will illuminate the "+" LED for the positive line and the "–" LED for the negative line.

SPECIFICATIONS

OPERATIONAL RANGE	AC 20-600 VAC/20-1000 VDC
MAXIMUM VOLTAGE	750 VAC/1000 VDC line to line
DETECTION THRESHOLDS	14 VAC 3-Phase/18.5 VAC Single 15 VDC Stored Energy
POWER CONSUMPTION	1.2 Watts @ 750 VAC
OPERATING TEMPERATURE	-4° to 131°F (-20° to +55°C)
ENCLOSURE	Totally Encapsulated UL Type 4X
TERMINATIONS	(4) 6 ft, 18 AWG 1000V, UL-1452
WEIGHT	7 oz.

INDICATOR FLASH RATES (L1, L2, L3, GND)

3- Phase Line-To-Line (VAC)	<14	20	120	240	480	600	750
Flashes/Sec (Typical)	0	0.9	2.6	3.3	3.7	3.8	3.9
DC or Stored Energy (VDC)	<15	20	48	110	300	600	1000
Flashes/Sec (Typical)	0	0.9	1.9	3.2	3.7	4.0	4.0

Epileptic Photosensitivity Compliance: Below 5-30 Flashes/Sec

GND DETECTOR THRESHOLDS (LEAKAGE ANY PHASE-TO-GROUND)

3- Phase Line-To-Line (VAC)	20	120	240	480	750
L1, L2, or L3 To Ground Continuity (OHMS)	2M	5M	7.5M	13M	20M
Detector Included Fault Current (µA)	4	12	17	20	21

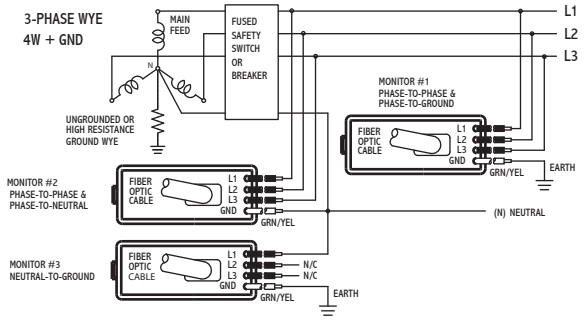
DETECTOR INCLUDED FAULT CURRENT (PHASE-TO-GROUND SHORT)

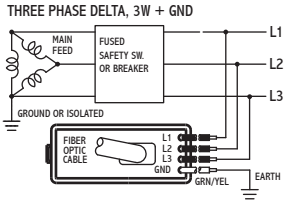
3- Phase Line-To-Line (VAC)	20	120	240	480	750
0 OHM Phase-To-Ground Current (µA)	15	105	216	435	684

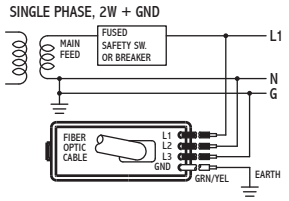
ORDERING INFORMATION

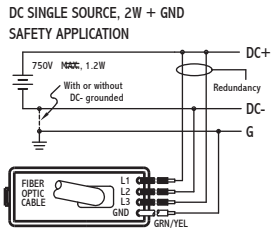
MODEL NUMBER	DESCRIPTION
UPA-200-12	30mm Universal Power Fiber Optic Alert 12" Fiber Optic
UPA-200-24	24" Fiber Optic
UPA-200-48	48" Fiber Optic

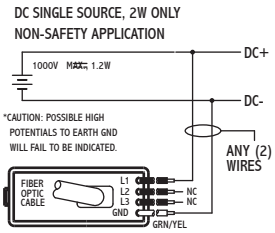
WIRING

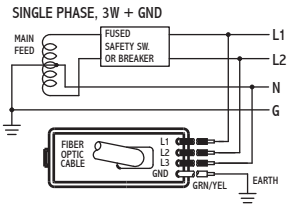




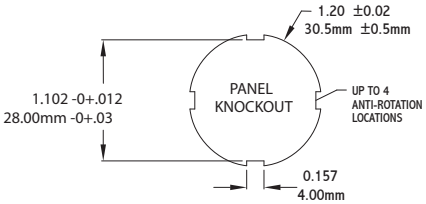


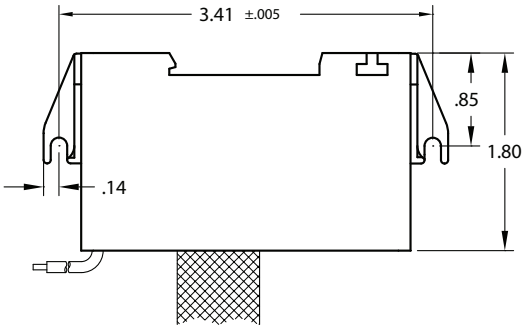


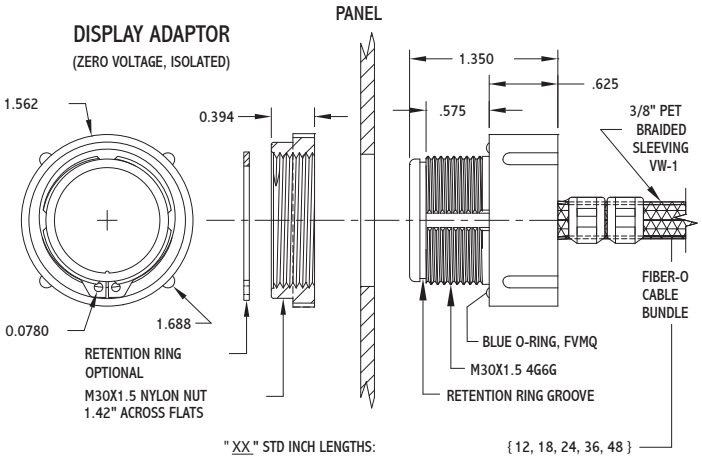


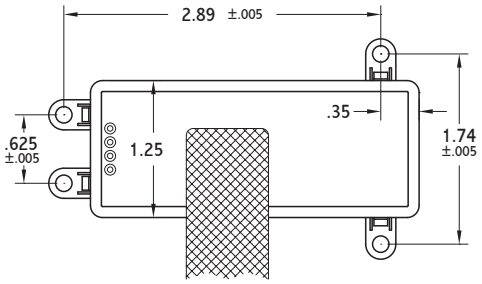


DIMENSIONS









E55826

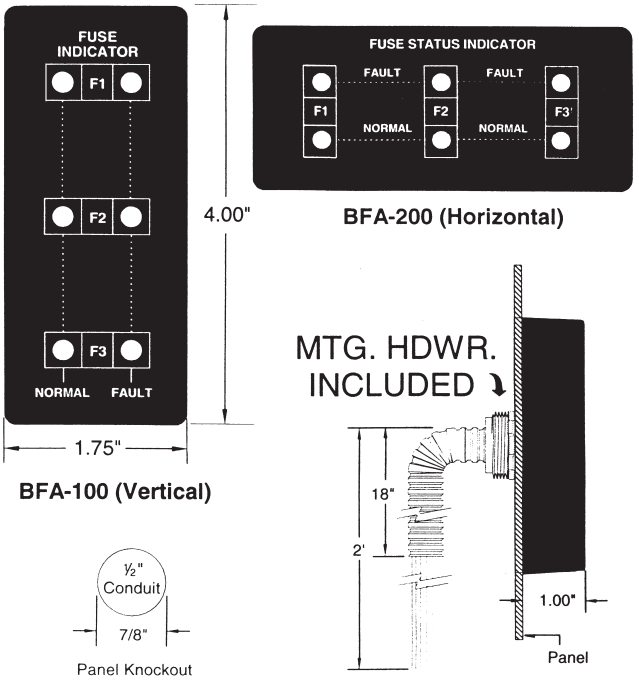
Fuse Status Indicator

- Shows Normal and Open Fuse
- View Status from a Distance
- Reports Connection Integrity
- Universal Input 208-600 VAC
- Mounts External to Panel
- For All Fuses UL Class H, J, K, R, RK
- Vertical or Horizontal Mount

ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
BFA-100	Vertical Mount
BFA-200	Horizontal Mount

DIMENSIONS (INCHES)



OPERATION

With nominal 3-phase line voltage applied, a flashing green NORMAL LED gives positive indication of a **good fuse** and integrity of the wire connection to each side of the fuse.[1]

A flashing red FAULT LED gives positive indication of an unconnected or **open fuse**, or a BFA wiring fault that needs corrected such as a lost connection to either side of the fuse or mismatched line and load wires.[2]

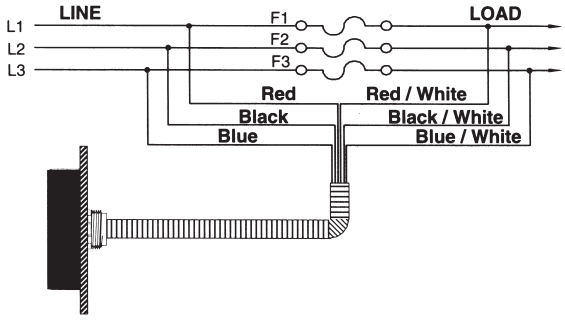
When phase loss occurs, both FAULT and NORMAL LEDS will extinguish.[3] The BFA will continue to indicate the status of the fuse during a phase loss if a regenerated voltage is produced on the open phase from a rotating motor.[4]

1 2 3 4 BFA-SERIES Troubleshooting Guide

SPECIFICATIONS

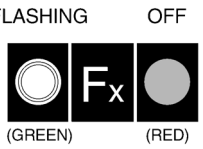
NOMINAL VOLTAGE	208-600 VAC, ±10%, Phase-to-Phase, 50/60 Hz	
MAX. CONTINUOUS VOLTAGE	660 VAC, Phase-to-Phase	
REV. CONNECTION PROTECTED	Yes	
DETECTION THRESHOLD	10-15 VAC Across Open Fuse	
MAXIMUM DETECTOR LEAKAGE CURRENT	0.5 mA @ 600 VAC (Approx.)	
FRESNEL LENS INDICATORS	Normal	(3) Green LEDs, 2 Flashes/Sec
	Fault	(3) Red LEDs, 2 Flashes/Sec
MAXIMUM RATED VOLTAGE	750 VAC/1000 VDC (LINE-TO-LINE or LINE-TO-GND)	
DETECTION THRESHOLDS	29 VAC 3-Phase, 40 VAC SINGLE-Phase, 27 VDC (TYP CUTOFF)	
POWER REQUIRED	2.5 VA @ 208 VAC, and 5.5 VA @ 480 VAC	
TEMPERATURE	Operate	32° to 131°F (0° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	94V-0 Flame Retardant Black ABS Plastic, Panel Mount with 1/2" Plastic Electrical Conduit Adapter; Encapsulated for Environmental Protection.	
TERMINATIONS	(6) 2', 18 AWG, 600V, 105°C PVC Stranded Wire w/Wire Pin Terminations, Jacketed with 18" Slit Nylon Corrugated Tubing, .556" OD	
WEIGHT	NET: 3.52 oz	Shipping: 5.12 oz

WIRING



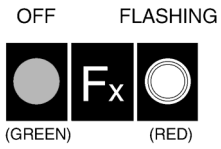
BFA-SERIES 3 PHASE FUSE STATUS INDICATOR TROUBLESHOOTING GUIDE

1.



A. Normal, fuse good, electrical contact across fuse

2.

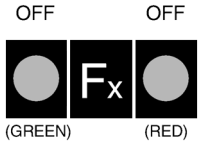


A. Unconnected or blown fuse

B. Bad Connection Load Side (white stripe wire)

C. Both of the above

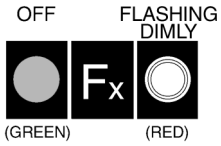
3.



A. Phase voltage loss with no motor regeneration

B. The above accompanied with an unconnected or blown fuse

4.



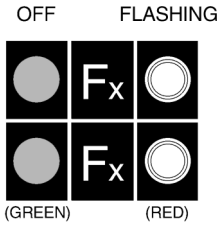
A. Bad Connection Line Side (solid color wire)

B. The above accompanied with an unconnected or blown fuse

C. Phase Voltage loss with motor regeneration accompanied with an unconnected or blown fuse

---

5.

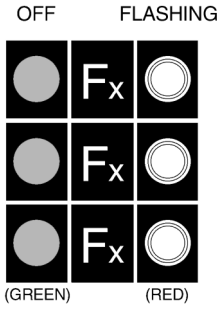


A. (2) Unconnected or blown fuses

B. Corresponding wires interchanged between solid colors or white stripe colors

C. 1 or 2 unconnected or blown fuses and B

6.



A. (3) Unconnected or blown fuses

B. Line Side connections do not correspond to Load Side connections

C. 1 or more unconnected or blown fuses and B

CAUTION: The BFA should not be confused with ATC Diversified Electronics 3-Phase Voltage Detectors. The BFA is designed to detect blown fuses and not voltage potentials from Phase-to-Ground or Phase-to-Phase in the 40 VAC range and up. It should be understood that dangerous voltage potentials can still exist within the panel even though the BFA has no LEDs flashing. For voltage detection see The ATC Diversified UPA Series Power Alerts.

3-Phase Ground Fault Display

The ATC Diversified Electronics **GFD Series** is intended for the use on ungrounded systems to detect and indicate the phase of the first ground fault condition. This enables corrective action to avoid the potential hazards resulting from a second ground fault.

OPERATION

With nominal 3 phase line voltage applied, a flashing NORMAL green LED gives indication of a non-fault condition and integrity of the wire connection to the corresponding phase.

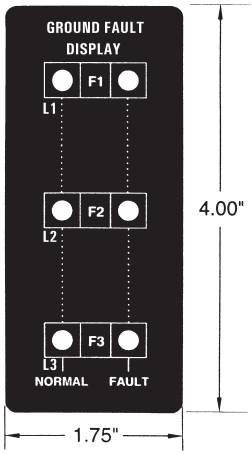
A flashing red LED gives positive FAULT indication of either a phase-to-ground fault, or a lost connection to the corresponding phase.

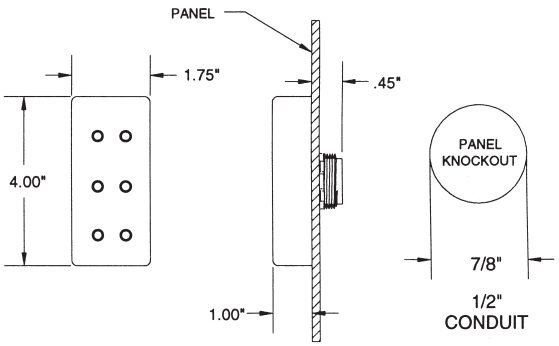
NOTE: Distributed capacitance to ground or equally loaded phases to ground will de-sensitize detection and will require lower phase-to-ground resistance to produce a FAULT indication.

SPECIFICATIONS

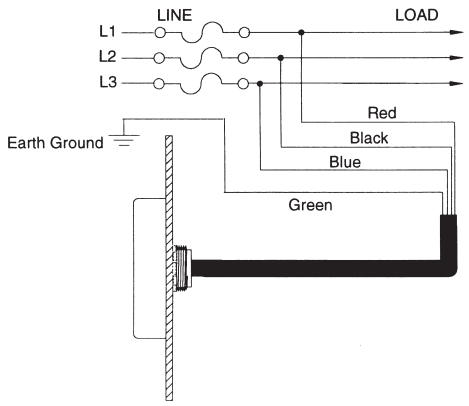
NOMINAL VOLTAGE	208-600 VAC, ±10%, Phase-to-Phase, 50/60 Hz	
MAX. CONTINUOUS VOLTAGE	660 VAC, Phase-to-Phase	
REV. CONNECTION PROTECTED	Yes	
DETECTION THRESHOLD	11.7 k Ω ±20% @ 50 Hz; 9.3 k Ω ±20% @ 60 Hz Single Phase-to-Ground	
DETECTOR INDUCED FAULT CURRENT	50 Hz	7.5 mA @ 600 VAC (1 Phase-to-Ground shorted)
	60 Hz	9 mA @ 600 VAC (1 Phase-to-Ground shorted)
FRESNEL LENS INDICATORS	Normal	(3) Green LEDs, 2 Flashes/Sec
	Fault	(3) Red LEDs, 2 Flashes/Sec
APPARENT POWER REQUIRED	50 Hz	2.5 VA @ 600 VAC
	60 Hz	3 VA @ 600 VAC
TEMPERATURE RATINGS	Operate	32° to 131°F (0° to +55°C)
	Storage	-40° to 185°F (-40° to +85°C)
ENCLOSURE	94V-0 Flame Retardant Black ABS Plastic, Panel Mount with 1/4" Plastic Electrical Conduit Adapter, Encapsulated for Environmental Protection	
TERMINATIONS	(4) 2 ft., 18 AWG, 600V, 105°C PVC Stranded Wire w/ Wire Pin Terminations, racketed with 18" Slit Nylon Corrugated Tubing, .556" O.D.	
WEIGHT	NET: 3.52 oz	Shipping: 5.12 oz

DIMENSIONS (INCHES)





WIRING



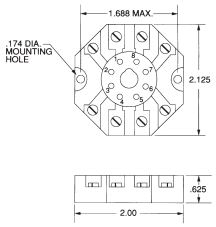
ORDERING INFORMATION

MODEL NUMBER	DESCRIPTION
GFD-100	Vertical Mount
GFD-200	Horizontal Mount

RELAY SOCKETS

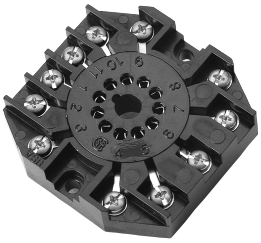
SURFACE MOUNTED— RB-08

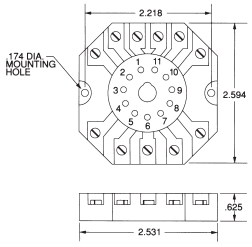
Recommended for use with all 8 pin octal plug-in devices. UL Recognized and CSA Certified for 10 Amps @ 600 VAC. The molded thermoplastic base has brass, nickel plated inserts with #6-32 steel, nickel plated screws.



SURFACE MOUNTED— RB-11

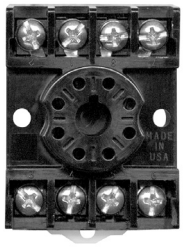
Recommended for use with all 11-pin magnal plug-in devices. UL Recognized and CSA certified for 10 Amp @ 300 VAC. The molded thermoplastic base has brass, nickel plated inserts with #6-32 steel, nickel plated screws.

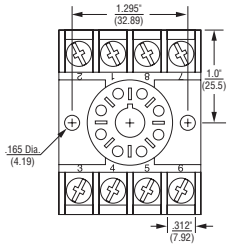




DIN RAIL/SURFACE MOUNTED—OT-08

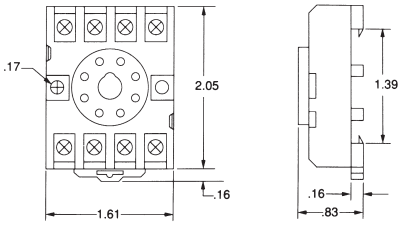
DIN Rail mount. Recommended for use with all 8 pin octal plugin devices. UL Recognized and CSA Certified for 10 Amps @ 600 VAC. The molded thermoplastic base has brass, nickel plated inserts with #6-32 nickel plated screws.





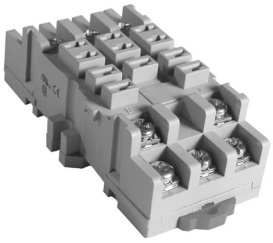
DIN RAIL/SURFACE MOUNTED—PFO83A

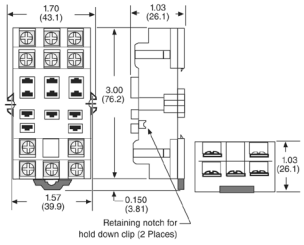
Recommended for use with all 8 pin octal plug-in devices. UL Recognized and CSA Certified for 10 Amps @ 300 VAC. The molded polycarbonate base has brass, nickel plated inserts with #6-40 steel, nickel plated screws and captive self-lifting terminal clamps.



SURFACE MOUNTED— 70-463-1

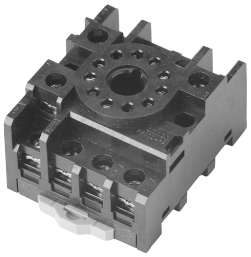
Recommended for use with all 0.187 blade 11 Pin Square base plug-in devices. UL Recognized and CSA Certified for 10 Amps @ 300 VAC. The molded thermoplastic base has brass, nickel plated inserts with #6-32 steel, nickel plated screws.

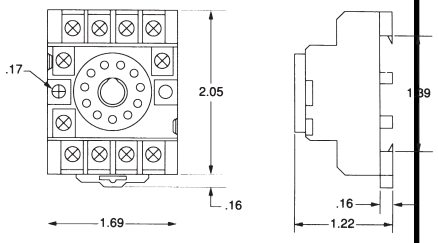




DIN RAIL/SURFACE MOUNTED—PF113A

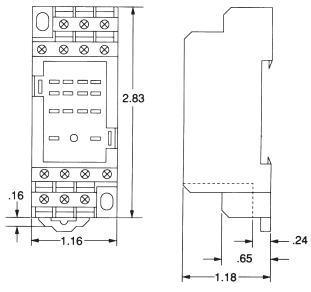
Recommended for use with all 11 pin magnal plug-in devices. UL Recognized and CSA certified for 10 Amps @ 300 VAC. The molded polycarbonate base has brass, nickel plated inserts with #6-40 steel, nickel plated screws and captive self lifting terminal clamps.





DIN RAIL/SURFACE MOUNTED—PYF14A

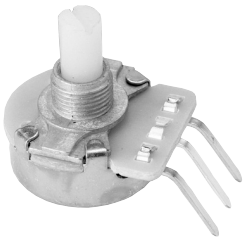
Recommended for use with all 14 pin multi-contact square base devices. UL Recognized and CSA Certified for 5 Amps @ 300 VAC. The molded polycarbonate base has brass, nickel plated inserts with #4-40 steel, nickel plated screws and captive self-lifting terminal clamps.

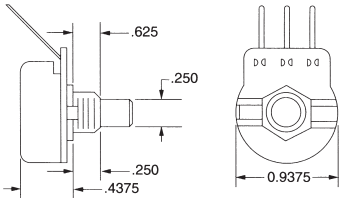


ACCESSORIES

ADJUSTMENT—101026105

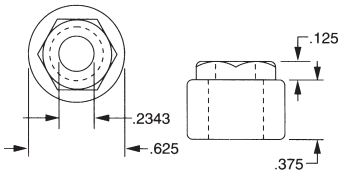
Recommended for use with all the ATC Diversified Electronics family of "remote adjustable" timers. Proper spacing is maintained for UL and CSA applications. This linear taper potentiometer has a non-conductive shaft attached to the internal conductive plastic wafer. The brass bushing is 3/8" x 32NEF and accepts adjustment hardware 100054070, 100054071





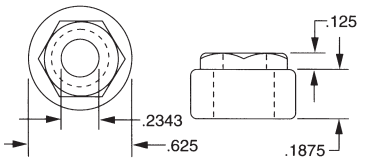
ADJUSTMENT HARDWARE LOCK NUT—100054070

Recommended for use with any adjustment or switch having a 3/8" x 32NEF bushing and 1/4" shaft. When the nut is tightened, the tapered center hole squeezes the shaft, preventing vibration mis-adjustment. Molded from black glass filled nylon with a UL 94V-0 rating.



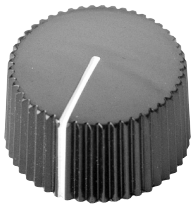
FLAT NUT—100054071

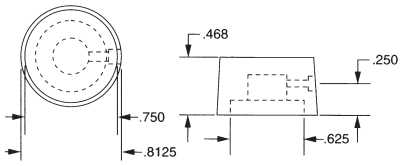
Recommended for use with any adjustment or switch having a 3/8" x 32NEF bushing and 1/4" shaft. Ideally suited for a 101026105 adjustment and 100054073 knob. This combination allows for no exposed metal parts required by UL and CSA. Molded from black, glass filled nylon with a UL 94V-0 rating.



KNOB—100054073

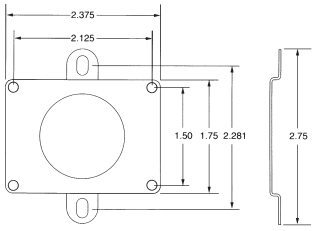
Recommended for use with any adjustment or switch having a 1/4" shaft. This knob slips over the shaft and is secured in place by a #6-32 set screw. The knurled, mirror finished, black thermostat knob has a white pointer line for reference.





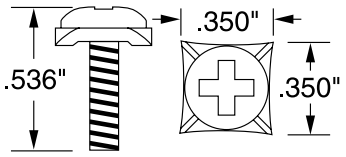
HOLD DOWN BRACKET—100054080

Recommended for use with ATC-Diversified Electronics devices having octal or magnal plug-in bases. Made of .040 steel with a yellow chromate coating. The bracket secures to the enclosure via four (4) corner screws and can be factory assembled to any device when ordered.



SADDLE CLAMP SCREW—100054226

The Saddle Clamp Screw can be used with all ATC-Diversified Electronics Style E surface mount enclosures.



SPRING CLIP—100054275

Spring Clip. Set of 2. Can only be used with the PF083A socket.